Total No. of Questions—**8**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-1001

S.E. (Civil) (First Semester) EXAMINATION, 2015

ENGINEERING MATHEMATICS III

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of electronic pocket calculator and steam tables is allowed.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Solve any *two* of the following : [8]

(*i*) $\dfrac{d^2y}{dx^2} + 2\dfrac{dy}{dx} + y = 4 + 2^x + 3e^{-x} + \cos x$

(*ii*) $x^3 \dfrac{d^3y}{dx^3} + 2x^2 \dfrac{d^2y}{dx^2} + 2y = x + x^{-1}$

(*iii*) Use the method of variation of parameters to solve the linear differential equation :

$$\frac{d^2y}{dx^2} + y = \operatorname{cosec} x .$$

P.T.O.

(*b*) Solve the following system of linear equations by Gauss Elimination method : [4]

$$5x - 2y + 2z = 5\,, \quad 2x + y - z = 2\,, \quad x - y + z = 1\,.$$

Or

2. (*a*) Solve the system of simultaneous symmetric equations : [4]

$$\frac{dx}{2x} = \frac{dy}{-y} = \frac{dz}{4xy^2 - 2z}\,.$$

(*b*) Apply Runge-Kutta method of 4th order to solve the differential equation :

$$\frac{dy}{dx} = x + y^2\,, \qquad y(0) = 1$$

to find y for $0 \le x \le 0.2$ with $h = 0.1$. [4]

(*c*) Solve the following system of equations by Cholesky method : [4]

$$2x + 3y + z = 0$$

$$x + 2y - z = -2$$

$$-x + y + 2z = 0\,.$$

3. (*a*) The first four moments about the value 4 are –1.5, 17, –30 and 108. Calculate the moments about the mean. Also find coefficient of skewness and kurtosis. [4]

(*b*) Assume the mean height of soldiers to be 68.22 inches with a variance of 10.8 inches. How many soldiers in a regiment of 10,000 would you expect to be over 6 feet tall, where the data is normally distributed. (Given : $\phi(1.15) = 0.3749$) [4]

(*c*) Find the directional derivative of

$$\phi = xy^2 + yz^3$$

at the point (2, −1, 1) in the direction of vector $i + 2j + 2k$. [4]

Or

4. (*a*) Attempt any *one* : [4]

(*i*) Prove that $\frac{\bar{r}}{r^3}$ is solenoidal.

(*ii*) Show that :

$$\nabla \cdot \left[r \nabla \frac{1}{r^n} \right] = \frac{n(n-2)}{r^{n+2}}.$$

(*b*) Verify whether :

$$\bar{F} = (2xyz^2)i + (x^2z^2 + z\cos yz)j + (2x^2yz + y\cos yz)k$$

is irrotational. [4]

(*c*) Two lines of regression are :

$$5y - 8x + 17 = 0 \quad \text{and} \quad 2y - 5x + 14 = 0 .$$

If $\sigma_y^2 = 16$, find : [4]

(*i*) σ_x^2

(*ii*) Coefficient of correlation.

5. (*a*) Evaluate $\int_C \bar{F} . d\bar{r}$ for

$$\bar{F} = (2xy + 3x^2)\bar{i} + (x^2 + 4yz)\bar{j} + (2y^2 + 6yz)\bar{k}$$

where C is the curve $x = t$, $y = t^2$, $z = t^3$ joining (0, 0, 0) and (1, 1, 1). [4]

(*b*) Use divergence theorem to evaluate $\iint_S \bar{F} . d\bar{s}$

for $\bar{F} = 4xz\,\bar{i} - y^2\,\bar{j} + yz\,\bar{k}$ over the surface of cube bounded by the planes $x = 0$, $x = 2$, $y = 0$, $y = 2$, $z = 0$, $z = 2$. [4]

(*c*) Using Stokes' theorem evaluate $\iint_S (\nabla \times \bar{F}) . d\bar{s}$

for $\bar{F} = (x^3 - y^3)\bar{i} - xyz\,\bar{j} + y^3\,\bar{k}$ where S is the surface $x^2 + ay^2 + z^2 - 2x = 4$ above the plane $x = 0$. [5]

Or

6. (*a*) Using Green's theorem, evaluate $\oint \bar{F} \cdot d\bar{r}$ for the field :

$$\bar{F} = x^2 \bar{i} + xy \bar{j}$$

over the region R enclosed by $y = x^2$ and then line $y = x$. [4]

(*b*) Use divergence theorem to evaluate :

$$\iint_S (x^3 \bar{i} + y^3 \bar{j} + z^3 \bar{k}) \cdot d\bar{s}$$

where S is the surface of the sphere $x^2 + y^2 + z^2 = 16$. [4]

(*c*) Evaluate $\int_C \bar{F} \cdot d\bar{r}$ using Stokes' theorem for :

$$\bar{F} = 4y \bar{i} + 2z \bar{j} + 6y \bar{k}$$

where C is the intersection of :

$$x^2 + y^2 + z^2 = 2z, \quad x = z - 1 . \qquad [5]$$

7. (*a*) A string is stretched and fastened to two points l apart. Motion is started by displacing the string in the form $y = a \sin \frac{\pi x}{l}$ from which it is released at time $t = 0$. Show that the displacement of any point at a distance x from one end at time t is given by : [7]

$$y(x, t) = a \sin\left(\frac{\pi x}{l}\right) \cos\left(\frac{\pi ct}{l}\right).$$

(*b*) Solve :

$$\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}$$

subject to : [6]

(*i*) $u(0, t) = 0$

(*ii*) $u_x(l, t) = 0$

(*iii*) $u(x, t)$ is bounded and

(*iv*) $u(x, 0) = \frac{u_0 x}{l}, \ 0 \le x \le l$.

Or

8. (*a*) Solve the equation :

$$\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = 0$$

subject to : [7]

(*i*) $v = 0$ when $y \to \infty$ for all x

(*ii*) $v = 0$ when $x = 0$ for all y

(*iii*) $v = 0$ when $x = l$ for all y

(*iv*) $v = x(l - x)$ when $y = 0$ for $0 < x < l$ T.

(*b*) Solve the wave equation : [6]

$$\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2}$$

under the conditions :

(*i*) $u(0, t) = 0$

(*ii*) $u(\pi, t) = 0$

(*iii*) $\left(\frac{\partial u}{\partial t}\right)_{t=0} = 0$

(*iv*) $u(x, 0) = x, \quad 0 < x < \pi$.

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1002

S.E. (Civil) (I Sem.) EXAMINATION, 2015

BUILDING TECHNOLOGY AND MATERIALS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Discuss the need of Damp Proof course for roofs and basement. [6]

(*b*) Discuss the properties of a good brick used in construction. [6]

Or

2. (*a*) Write a short note on English bond with a neat labelled diagram. [6]

(*b*) Discuss the method underpinning. [6]

P.T.O.

3. (*a*) With a figure explain the Chequer board method of construction of floors. [6]

(*b*) Draw a neat, labelled figured of semi-circular arch and name the various components. [6]

Or

4. (*a*) Explain the IS specifications for Cement concrete flooring tiles. [6]

(*b*) Explain the following with sketches : [6]

(*i*) Dormer window

(*ii*) Meeting style

(*iii*) Barrel bolt.

5. (*a*) Explain the following with sketches : [6]

(*i*) Baluster

(*ii*) Scotia

(*iii*) Landing.

(*b*) Explain the types of Lintels and discuss about any *two*. [7]

Or

6. (*a*) State the requirements of a good stair with respect to : [7]

(*i*) Pitch

(*ii*) Head room

(*iii*) Location

(*iv*) Number of steps in a flight

(*v*) Rise and Tread

(*vi*) Width of stair.

(*b*) Enlist types of stairs depending on the materials of construction. Explain any *one* in detail. [6]

7. (*a*) Define seasoning of timber. Explain defects in timber. [6]

(*b*) Enlist types of pointing and explain any *three* types of pointing with figures. [7]

Or

8. (*a*) Draw the figures showing different types of pointing. [7]

(*b*) Write a short note on Wall cladding. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-1003

S.E. (Civil) (First Semester) EXAMINATION, 2015

STRENGTH OF MATERIALS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of electronic pocket calculator is allowed.

(*iv*) Assume suitable data, if necessary.

(*v*) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 and Q. No. 7 or Q. No. 8.

1. (*a*) A compound bar ABC 1.5 m long is made up of two parts 'AB' of aluminium and 'BC' of steel having cross-sectional area of steel half of the aluminum bar. The rod is fixed at 'A' and subjected to an axial pull of 200 kN at end 'C'. If the elongations of both materials is equal, find the lengths of each part assuming E_{steel} = 200 GPa and $E_{aluminium}$ as one third of steel. [6]

P.T.O.

(*b*) A simply supported beam 8 m span carries u.d.l. of 3 kN/m over entire span. Find the maximum bending stress induced if the cross-section is as shown in Fig. 1. [6]

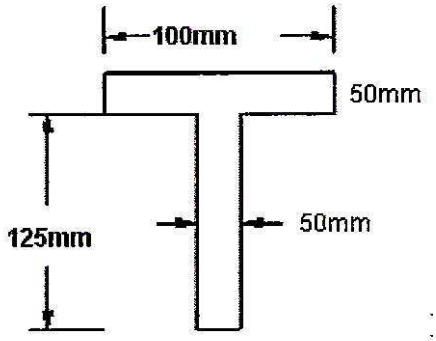


Fig. 1

Or

2. (*a*) A steel bar 2 m long is at 30°C. The temperature of the rod is increased by 150°C. Find : [6]

(*i*) free expansion of the rod

(*ii*) temperature stress produced if expansion is prevented and nature of the stress

(*iii*) stress produced if 2.5 mm expansion is permitted. Assume supports are unyielding ? Take E = 210 GPa, and $\alpha = 12 \times 10^{-6}$/°C. Assume bar diameter = 16 mm.

(*b*) An I section has the following dimensions. Web : 300 mm × 10 mm, Flange 150 mm × 20 mm. The maximum shear stress developed in the beam is 14.8 MPa. Find the shear force to which the beam is subjected. [6]

3. (*a*) Find maximum torque that can be safely applied to a shaft of 80 mm diameter. The permissible angle of twist is 1.5 degree in a length of 5 m and shear stress not to exceed 42 MPa. Take G = 84 MPa. [6]

(*b*) A shaft of 95 mm diameter transmits 200 kW power at 100 rpm. If at a section bending moment is 15 kNm, then find the principal stress, maximum shear stress. [6]

Or

4. (*a*) A steel rod 28 mm in diameter is 3.5 m long. Find the maximum instantaneous stress induced and work done at maximum elongation when a load of 80 kN is suddenly applied. Take E = 210 GPa. [6]

(*b*) A hollow shaft having an inside diameter 60% of its outer is to replace a solid shaft transmitting the same power at same speed. Calculate the percentage saving in material if material to be used is also the same. [6]

5. (*a*) An overhanging beam ABC with end 'A' hinged and simply supported at 'B' is loaded with udl of intensity 30 kN/m acting on 2 m length from 'A' and a point load of 10 kN acting at free end 'C'. Draw B.M.D. and S.F.D. Assume 1(AB) = 4 m and 1(BC) = 1 m. [7]

(*b*) Draw shear force diagram, bending moment diagram and axial thrust diagram for the beam ABCD with end 'A' hinged and loaded as shown in Fig. 2. [6]

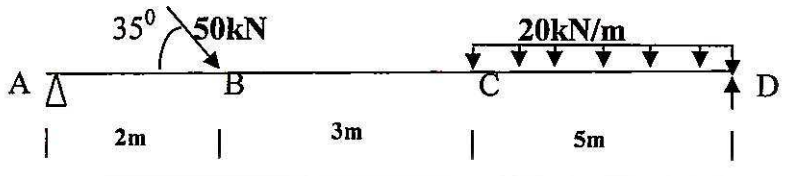


Fig. 2

Or

6. (*a*) Draw Shear force diagram and Bending Moment diagram for the beam as shown in Fig. 3. Indicate the numerical values at all important section. Find the position and value of maximum bending moment. [7]

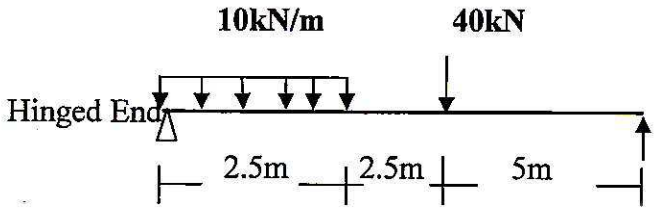


Fig. 3

(*b*) The diagram shown in Fig. 4 is the shear force diagram for a beam which rests on two supports, one being at the left hand end. No couple is acting on beam. [6]

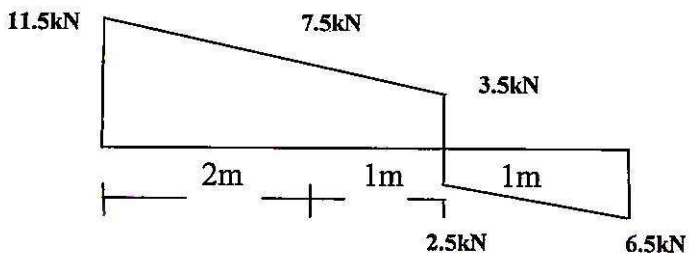


Fig. 4

7. (*a*) Compare the crippling loads given by the Euler's and Rankine's formula for a circular column of 40 mm diameter and 2000 m long. Take yield stress as 300 MPa. Rankine's constant a = 1/7500 and E = 200 GPa. [6]

(*b*) State assumptions made in Euler's theory and its limitations. [7]

Or

8. (*a*) Explain core of the section and hence obtain a core section for a hollow circular column of external and internal diameter 'D' and '*d*' respectively. [6]

(*b*) A hollow rectangular section is having external size 500 mm × 450 mm and internal size 400 mm × 350 mm. It carries a vertical load of 100 kN at the outer edge of the column on X-axis. Calculate maximum and minimum intensities of stress in the section. Assume 500 mm side horizontal. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1004

S.E. (Civil) (First Semester) EXAMINATION, 2015

SURVEYING

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*iv*) Assume suitable data, if necessary.

1. (*a*) What are the types of error in plane tabling ? How are they minimized ? [6]

(*b*) The following reciprocal levels were taken with one level : [6]

Instrument at	**Reading on**		**Remarks**
	A	**B**	
A	1.884	2.896	Distance between A & B = 900 m
B	0.537	1.894	R.L. of A = 300 m

Determine :

(*i*) The true difference in elevation between A & B.

(*ii*) The reduced level of B.

(*iii*) The error in the collimation adjustment of the level.

P.T.O.

Or

2. (*a*) State the uses and characteristics of contour lines. [4]

(*b*) Find the distance to the visible horizon from the top of a light-house 60 m high. [2]

(*c*) Determine the Fore bearing and back bearing of all the lines in a regular closed (pentagon) from the following direction : [6]

(*i*) Traversing was done in clockwise direction.

(*ii*) Local attraction was not suspected at any station.

(*iii*) Fore bearing of line CD of the closed traverse ABCDEA was observed to be 35° 30'. Draw rough sketch of the traverse.

3. (*a*) What is meant by theodolite traversing ? State various methods of theodolite traversing. [6]

(*b*) Tabulate the data required for setting out the circular curve by the deflection angle method using the following data : [6]

(*i*) Chainage of intersection point = 1580 m

(*ii*) Deflection angle = 35°

(*iii*) Degree of curve = 5°

(*iv*) Peg interval = 30 m.

Or

4. (*a*) State various obstacles in setting out curves. Explain the procedure of setting out simple curve when point of intersection is inaccessible. [6]

(*b*) Two stations A and B are fixed on either side of a wood. The following traverse is run from A to B along the side of the wood : [6]

Line	Latitude	Departure
AC	+290.8 m	+327.5 m
CD	–229.2 m	+623.2 m
DB	–516.6 m	+267.8 m

Determine the length and bearing of AB and DA.

5. (*a*) Enlist the fundamental axes of a transit theodolite and desribe how will you make the trunnion axis perpendicular to the vertical axis. [5]

(*b*) A tacheometer with anallatic lense having the value of constant 100 was used and the following observations were made on staff held vertical : [8]

Instrument Station	H.I. in Meter	Vertical Angle	Staff At	Staff Reading in m
P	1.80	2°40'	M	1.25, 1.93, 2.56
		–4°40'	Q	1.45, 1.85, 2.30

R.L. of station M is 50 m. Calculate the R.L. of P & Q, distance PQ and gradient.

Or

6. (*a*) Explain the test and adjustment for making the line of collimation right angle to the horizontal axis. [5]

(*b*) Draw the sketches of different stadio lines. [4]

(*c*) Determine reduced level of horizontal line of sight from given data. Assume multiply constant 100 with anallatic lens : [4]

Instrument Station	Staff Station	Vertical Angle	Stadio Reading	Remark
A	B	8°20'	0.990, 1.555, 2.120	R.L. of B 100.00 m

7. (*a*) Explain distance and angle measurement with total station. [6]

(*b*) Explain the method of transfer of centre line in long tunnels. [7]

Or

8. (*a*) What is total station ? State the classification based on range of total station. [7]

(*b*) Define gradient. What is the importance of gradient while laying sewer pipe ? How is it decided ? [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1005

S.E. (Civil) (First Semester) EXAMINATION, 2015
GEOTECHNICAL ENGINEERING
(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*iv*) Assume suitable data if necessary.

(*v*) Neat diagrams must be drawn wherever necessary.

1. (*a*) Starting from first principles derive the following equations with usual nomenclature : [6]

$$\gamma = \frac{(G + eS_r)\gamma_\omega}{(1 + e)}.$$

(*b*) Explain with diagram a method for determining coefficient of permeability 'K' for clayey soils in the laboratory. [6]

P.T.O.

Or

2. (*a*) On a single graph paper, draw neat labelled graphs for : [6]

(*i*) Uniformly graded soil

(*ii*) Well graded soil

(*iii*) Gap graded soil

(*iv*) Show on the same graph, zones of clay size, silt size, sand and gravel clearly.

(*b*) State the applications of flownet and explain how seepage through a dam can be determined using flow net. (State the equation and terms involved in it). [6]

3. (*a*) Write a note on Vane Shear Test with neat sketch and the formulae involved. [6]

(*b*) A load 1000 kN acts as a point load at the surface of a soil mass. Estimate the stress at a point 3 m below and 4 m away from the point of action of the load by Boussinesq's formula. Compare the value with the result from Westergaard's theory. [6]

Or

4. (*a*) Draw a curve showing the relation between dry density and moisture content for Standard Proctor test and indicate the salient features of the curve. [6]

(*b*) Define total and effective stress.

Determine the shear strength in terms of effective stress on a plane within a saturated soil mass at a point where the total normal stress is 200 kN/m^2 and the pore water pressure is 80 kN/m^2. The effective stress shear strength parameters for the soil are c' = 16 kN/m^2 and Φ' = 39°. [6]

5. (*a*) Describe Rehbann's construction for determination of earth pressure with neat sketch. [7]

(*b*) Derive the expression for the active state of pressure at any point for a submerged cohesionless backfill along with pressure diagrams. [6]

Or

6. (*a*) Explain how surcharge will affect earth pressure for cohesionless and cohesive soils in active state with pressure diagrams. [7]

(*b*) A smooth vertical wall retains a level surface with γ = 18 kN/m^3, ϕ = 30°, to a depth of 8 m. Draw the lateral pressure diagram and compute the total active pressure in dry condition and when water table rises to the GL. Assume γ_{sat} = 22 kN/m^3. [6]

7. (*a*) Write short notes on causes and remedial measures of Landslides. [7]

(*b*) Explain controlling techniques for subsurface contamination. [6]

Or

8. (*a*) What is slope stability and how are the different types of factor of safety determined ? [7]

(*b*) Discuss sources and types of ground contamination. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-1006

S.E. (Civil Engineering) (Second Semester)

EXAMINATION, 2015

CONCRETE TECHNOLOGY

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Your answers will be valued as a whole.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

(*vii*) Use of IS code 10262, 456 is not allowed.

1. (*a*) What are the minor compounds in Portland cement ? What is their role. [6]

(*b*) Explain the physical properties of aggregates affecting workability of concrete. [6]

P.T.O.

Or

2. (*a*) What are the functions of types of admixtures ? [6]

(*b*) Define creep of the concrete. What are the factors affecting creep of concrete. [6]

3. (*a*) State the various types of non-destructive tests carried on hardened concrete. Explain "Impact echo test" for determination of concrete properties. [6]

(*b*) Describe the types of vibrators used for compaction of concrete. [6]

Or

4. (*a*) Write short notes on : [6]

(*i*) Cellular light weight concrete

(*ii*) Self-compacting concrete.

(*b*) Define Ferro cement. Explain the basic concepts in forming ferrocement composites used in the construction industry. [6]

5. Using Indian Standard recommended guidelines, design a concrete mix for a reinforced concrete structure to be subjected to the mild exposure conditions for the following requirements : [13]

(A) Stipulations for proportioning :

(*a*) Grade designation : M30

(*b*) Standard deviation, s = 5

(*c*) Type of cement : OPC 43 grade conforming to IS8112

(*d*) Workability : 75 mm (slump)

(*e*) Degree of supervision : Good

(*f*) Type of aggregate : Angular coarse aggregate,

(*g*) Maximum cement content : 450 kg/m^3.

(B) Test data for materials :

(*a*) Specific gravity of cement : 3.15

(*b*) Specific gravity of :

(*i*) Coarse aggregate— 2.74

(*ii*) Fine aggregate— 2.74

(*c*) Water absorption :

(*i*) Coarse aggregates— 0.5%

(*ii*) Fine aggregates— 1.00%

(*d*) Free surface moisture :

(*i*) Coarse aggregates— Nil (absorbed moisture also nil)

(*ii*) Fine aggregates— Nil

(*e*) Sieve analysis :

(*i*) Coarse aggregate :

IS Sieve Sizes (mm)	Analysis of Coarse Aggregate Fraction		Percentage of different Fractions			Remarks
	I	II	I (60%)	II (40%)	Combined (100%)	Confirming of Table 2 of IS 383
20	100	100	60	40	100	
10	0	71.2	0	28.5	28.5	
4.75		9.40		3.7	3.7	
2.36		0				

(*ii*) Fine aggregate : Conforming to grading zone I

(C) Design considerations :

Table 1 : From IS 10262; Maximum water content per cubic meter of concrete :

Sr. No.	Nominal Maximum Size of Aggregate (mm)	Maximum Water Content (kg)
(*i*)	10	208
(*ii*)	20	186
(*iii*)	40	165

Table 2 : From IS 10262; Volume of Coarse Aggregate per Unit Volume of Total Aggregate :

Sr. No.	Nominal Maximum Size of Aggregate (mm)	Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate			
(1)	(2)				
		Zone IV	Zone III	Zone II	Zone I
(*i*)	10	0.50	0.48	0.46	0.44
(*ii*)	20	0.66	0.64	0.62	0.60
(*iii*)	40	0.75	0.73	0.71	0.69

Table 3 : From IS 456; Different exposure conditions for reinforced concrete :

Sr. No.	Exposure	Minimum cement content (kg/cubic m)	Maximum free water cement ratio	Minimum grade of concrete
(*i*)	Mild	300	0.55	M20
(*ii*)	Moderate	300	0.50	M25
(*iii*)	Severe	320	0.45	M30
(*iv*)	Very severe	340	0.45	M35
(*v*)	Extreme	360	0.40	M40

Or

6. (*a*) Write major factors affecting mix design. Explain water cement ratio. [4]

(*b*) Write a short note on statistical quality control of concrete. [4]

(*c*) Explain DOE method of mix design in brief. [5]

7. (*a*) State and explain factors affecting permeability of concrete. What measures should be taken to reduce permeability of concrete ? [8]

(*b*) Explain in detail corrosion monitoring techniques of reinforcement and its preventive measures. [5]

Or

8. (*a*) Write deatiled notes on : [8]

(*i*) Sulphate attack on concrete

(*ii*) Carbonation of concrete and its determination.

(*b*) What are the symptoms of distress of concrete ? [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-1007

S.E. (Civil) (Second Semester) EXAMINATION, 2015

ARCHITECTURAL PLANNING AND DESIGN OF BUILDINGS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Assume suitable data, if required.

(*ii*) Figures to the right indicate full marks.

(*iii*) Solve Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4** in answer-book.

(*iv*) Solve Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8** on Drawing Sheet only.

1. (*a*) Elaborate the term land use zoning and mention the requirements of each of them. (Minimum **4** zones) [7]

(*b*) Explain the following principles of architectural planning with suitable sketches : [6]

(*i*) Privacy

(*ii*) Roominess.

P.T.O.

Or

2. (*a*) Enlist documents to be submitted for Seeking Commencement Certificate and Occupancy Certificate. [6]

(*b*) Elaborate need for earthquake resistant structures in relation with–loss of human life; property and infrastructure. [7]

3. (*a*) What are Acoustical defects ? Explain any *two* in detail. [6]

(*b*) Differentiate between building line and control line by drawing a suitable sketch. [6]

Or

4. (*a*) The internal dimensions of a factory building are 30×20×10 (m^3). The number of air changes required per hour are 6, the indoor temperature is 36°C and outdoor temperature is 30°C. Find the area of openings required, if the distance between the inlet and outlet openings is 6 m. [6]

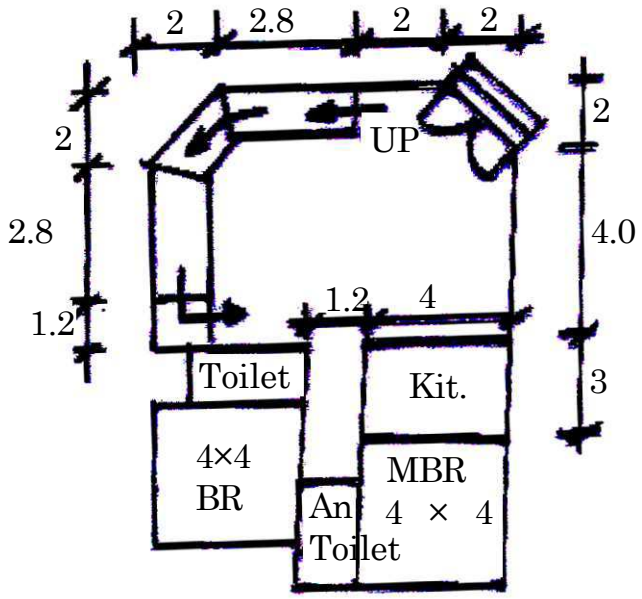
(*b*) Explain with sketch the following terms : [6]

(*i*) SP

(*ii*) CV

(*iii*) PP.

5. Draw a detailed floor plan to a scale of 1:50 of a residential building for the given line plan below. Use the following data : RCC framed structure, wall thk. 150 mm, Single storey building, Plinth height 450 mm. All dimensions in the sketch are in m. Indicate suitable locations and sizes of doors, windows in schedule of openings. Tread for the step is 280 mm. [13]



Or

6. Draw a detailed floor plan to a scale of 1:50 with the following data : [13]

(*i*) Living room 1 no. approx. area 15 m^2

(*ii*) Kitchen-cum-Dining 1 no. approx. area 15 m^2

(*iii*) Bed rooms 2 no. approx. area 12 m^2 each

(*iv*) Floor to floor height 3.3 m

(*v*) Load bearing structure

(*vi*) Foundation and plinth in UCR masonry

(*vii*) Varandah, passage, staircase, W.C. and Bath/attached toilet etc. of suitable sizes should be provided. Indicate the North.

7. Design a single storey hostel building and draw only line plan with the following data : [12]

(*i*) Number of students 50

(*ii*) Twenty rooms are two seated with 7.5 sq. m area per student and ten single seated with 9.5 sq. m area.

(*iii*) Recreation room approx. area 35 m^2

(*iv*) Gymnasium approx. area 15 m^2

(*v*) Office space approx. area 12 m^2

(*vi*) Store room approx. area 10 m^2

(*vii*) Varandah, passage, staircase, W.C. and Bath etc. of suitable size should be provided.

Show North direction and mention scale.

Or

8. Draw a line plan of a Post-office using the following data :[12]

Entrance and moving space : 30 m^2 with seating arrangement

Public dealing counters : 6 in no. with 0.5 m width

Post-master's room : 15 m^2

Working area for other staff : 30 m^2

Post separation room : 30 m^2

Safe custody area for cash : 10 m^2

Cash transaction room : 12 m^2

Speed post delivery section : 12 m^2

Water room and Toilet (separate for male and female) : 7.5 m^2.

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1008

S.E. (Civil Engineering) (Second Semester) EXAMINATION, 2015
ENGINEERING GEOLOGY
(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Write the answers to any *four* questions in a single answer-book.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data if necessary.

1. (*a*) Explain different forms of Minerals with suitable examples. [6]

(*b*) Describe Civil Engineering significance of foliations of metamorphic rocks. [6]

Or

2. (*a*) What are extrusive and intrusive Igneous bodies ? Describe various Discordant Igneous intrusive bodies with neat diagrams. [6]

(*b*) State and explain general principles of Stratigraphy. [6]

P.T.O.

3. (*a*) What is Fold ? Give nomenclature of the FOLD. Describe how fold passes into the Fault. [6]

(*b*) What are Joints ? How do they occur in igneous and metamorphic rocks ? Describe types of Joints and their Civil Engineering significance. [6]

Or

4. (*a*) What is Rejuvenation ? Explain *two* features resulting due to rejuvenation. [6]

(*b*) Write in detail mineral wealth of Gondwana. [6]

5. (*a*) What are the geological requirements for the foundation of Dam ? [6]

(*b*) Describe geological work of groundwater in detail. [7]

Or

6. (*a*) What is Artesian condition ? Explain any *three* geological conditions leading to artesian well. [7]

(*b*) Describe any *three* features developed due to marine erosion. [6]

7. (*a*) What difficulties you may face while tunnelling through : [7]

(*i*) Axial portion of Syncline

(*ii*) Dyke crossing the alignment.

(*b*) Define Remote sensing. Enlist elements of Remote Sensing. Explain any *two* elements. [6]

Or

8. (*a*) What observations and precautions are necessary during Core Drilling for Preliminary Geological Exploration ? [7]

(*b*) What is Landslide ? What are the causes of it ? [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-1009

S.E. (Civil) (Second Semester) EXAMINATION, 2015

STRUCTURAL ANALYSIS–I

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** and Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat sketches must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Use of cell phone is prohibited in the examination hall.

1. (*a*) A 4 m simply supported beam subjected to clockwise moment 20 kNm at mid span, determine maximum slope and deflection in term of EI. [6]

P.T.O.

(*b*) Determine moment at B for the continuous beam loaded and supported as shown in the Fig. 1(*b*) by Clapeyron's theorem. [6]

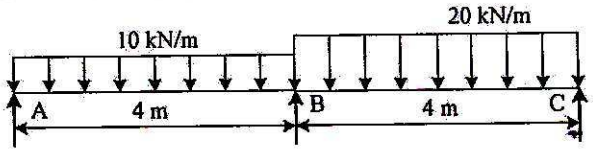


Fig. 1(*b*)

Or

2. (*a*) A propped cantilever of span 3 m loaded with uniformly distributed load 10 kN/m on entire span, determine the prop reaction. [6]

(*b*) Determine the fixed end moments for the fixed beam loaded and supported as shown in Fig. 2(*b*). [6]

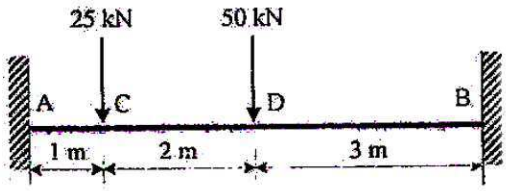


Fig. 2(*b*)

3. (*a*) Find the horizontal deflections of joint C of the truss shown in Fig. 3(*a*). The area of inclined member is 2000 mm^2 while the area of horizontal member is 1600 mm^2. Take E = 200 kN/mm^2. [6]

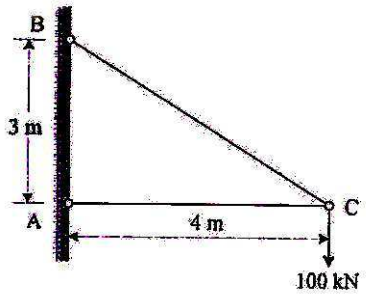


Fig. 3(*a*)

(*b*) A simply supported beam is loaded and supported as shown in Fig. 3(*b*). Determine support reaction at A, Shear and moment at C by drawing Influence line diagram. [6]

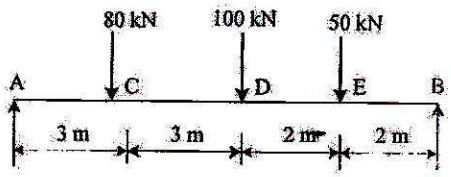


Fig. 3(*b*)

Or

4. (*a*) Find forces in members of the truss as shown in Fig. 4(*a*). Cross-sectional area and material of all members is same. [6]

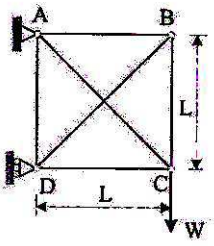


Fig. 4(*a*)

(*b*) Draw the influence line diagram for the members U_2U_3, L_2L_3 and U_2L_2 of a truss as shown in Fig. 4(*b*). [6]

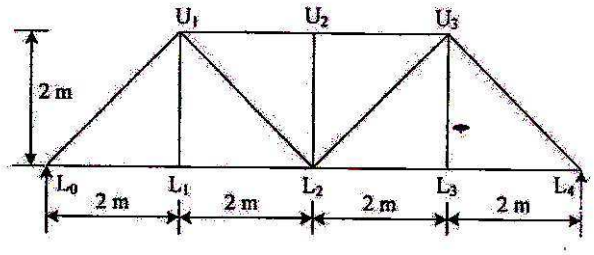


Fig. 4(*b*)

5. (*a*) A three hinge parabolic arch has a span of 24 m and a central rise of 4 m. It carries a concentrated load of 50 kN at 18 m from left support. Determine thrust and radial shear at a section 6 m from left support. [7]

(*b*) Derive the expression for horizontal thrust when a uniformly distributed load w is acting on entire span of two hinged semicircular arch. [6]

Or

6. (*a*) A three hinged circular arch has a span of 40 m and a central rise of 8 m. It carries a uniformly distributed load 20 kN/m over the left-half of span. Find the reaction at the supports and shear at a section 10 m from left support. [7]

(*b*) A two hinged parabolic arch of span 30 m and central rise 4 m is subjected to a point load of 30 kN at the center of the arch. Find the horizontal thrust and moment at 8 m from left hand support. [6]

7. (*a*) State and explain lower bound, upper bound and uniqueness theorem. [5]

(*b*) A beam fixed at both ends is subjected to central point load W. The beam is of uniform plastic moment M_P. Determine the magnitude of collapse load. [8]

Or

8. (*a*) Find the shape factor for circular cross-section of diameter *d*. [5]

(*b*) Determine collapse load in a propped cantilever of span L subjected to central concentrated load W. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4757]-101

S.E. (Civil) (I Sem.) EXAMINATION, 2015

ENGINEERING MATHEMATICS—III

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of non-programmable electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Solve the following (any *three*) : [12]

(*i*) $(D-1)^2 (D^2+1) y = e^x + \sin^2 \frac{x}{2}$

P.T.O.

(*ii*) $\left(D^2 + 3D + 2\right)y = xe^x \sin x$

(*iii*) $\left(D^2 - 1\right)y = e^{-x} \sin\left(e^{-x}\right) + \cos\left(e^{-x}\right)$

(By variation of parameter)

(*iv*) $\left(x^3D^3 + x^2D^2 - 2\right)y = x + \frac{1}{x^3}$ $\left(\text{where } D = \frac{d}{dx}\right)$

(*b*) Solve : [5]

$$\frac{dx}{x^2 + y^2} = \frac{dy}{2xy} = \frac{dz}{(x + y)^3 z}.$$

Or

2. (*a*) Solve the following (any *three*) : [12]

(*i*) $\left(D^3 - 3D^2 + 4D - 2\right)y = e^x + \cos x$

(*ii*) $\left(D^3 + 3D^2 - 4D - 12\right)y = 12xe^{-2x}$

(*iii*) $\left(D^3 - 6D^2 + 12D - 8\right)y = \frac{e^{2x}}{x}$

(*iv*) $(2 + 3x)^2 \frac{d^2y}{dx^2} + 3(2 + 3x)\frac{dy}{dx} - 36y = 3x^2 + 4x + 1.$

(*b*) Solve : [5]

$$\frac{dx}{dt} = 5x + y, \frac{dy}{dt} = y - 4x.$$

3. (*a*) Find the equation of the elastic curve and its maximum deflection for the simply supported beam of length 2L, having uniformly distributed load W per unit length. [8]

(*b*) Solve the equation :

$$\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$$

where $u(x, t)$ satisfies the following conditions :

(*i*) $u(0, t) = 0$

(*ii*) $u(\mathrm{L}, t) = 0$ for all t

(*iii*) $u(x, 0) = x \quad 0 < x < \mathrm{L}/2$

$= (\mathrm{L} - x) \quad \mathrm{L}/2 < x < \mathrm{L}.$ [8]

Or

4. (*a*) Determine whether resonance occurs in a system consisting of a weight 32 Lb. attached to a spring with constant K = 4 Lb/ft. and external force $16 \sin 2t$ and no damping force present, initially $x = \frac{1}{2}$ and $\frac{dx}{dt} = -4$. [8]

(*b*) Solve :

$$\frac{\partial^2 u}{\partial t^2} = 4 \frac{\partial^2 u}{\partial x^2}$$

subject to the conditions :

(*i*) $u(0, t) = 0$

(*ii*) $u(5, t) = 0$

(*iii*) $u(x, 0) = 0$

(*iv*) $\left(\frac{\partial u}{\partial t}\right)_{t=0} = 5 \sin \pi x.$ [8]

5. (*a*) Solve :

$$10x_1 - 7x_2 + 3x_3 + 5x_4 = 6$$

$$-6x_1 + 8x_2 - x_3 - 4x_4 = 5$$

$$3x_1 + x_2 + 4x_3 + 11x_4 = 2$$

$$5x_1 - 9x_2 - 2x_3 + 4x_4 = 7$$

by Gauss elimination method. [9]

(*b*) Using modified Euler's method, find $y(0.2)$ and $y(0.4)$ given $\frac{dy}{dx} = y + e^x$ $y(0) = 0$ with $h = 0.2$. [8]

Or

6. (*a*) Solve the equations :

$$10x_1 - 2x_2 - x_3 - x_4 = 3$$

$$-2x_1 + 10x_2 - x_3 - x_4 = 15$$

$$-x_1 - x_2 + 10x_3 - 2x_4 = 27$$

$$-x_1 - x_2 - 2x_3 + 10x_4 = -9$$

by Gauss-Seidel method. [8]

(*b*) Use Runge-Kutta method of fourth order solve :

$$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$$

with $y(0) = 1$ at $x = 0.2, 0.4$ with $h = 0.2$. [9]

SECTION II

7. (*a*) The first four moments about the working mean 28.5 of a distribution are 0.294, 7.144, 42.409 and 454.98. Calculate the moments about the mean. Also evaluate β_1, β_2. [6]

(*b*) Psychological tests of intelligence and Engineering ability were applied to 10 students. Here is a record of ungrouped data showing intelligence ratio (I.R.) and engineering ratio (E.R.). Calculate the coefficient of correlation : [6]

Student	**I.R.**	**E.R.**
1	105	101
2	104	103
3	102	100
4	101	98
5	100	95
6	99	96
7	98	104
8	96	92
9	93	97
10	92	94

(*c*) In a referendum 60% of voters voted in favour. A random sample of 200 voters was selected. What is the probability that in the sample :

(*i*) More than 130 voted in favour

(*ii*) 120 voted in favour. [5]

Or

8. (*a*) The following are scores of two batsmen A and B in a series of innings :

A	**B**
12	47
115	12
6	16
73	42
7	4
19	51
119	37
36	48
84	13
29	0

Who is better score getter and who is more consistent ? [7]

(*b*) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. [5]

(*c*) If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 2000 individuals more than two will get a bad reaction. [5]

9. (*a*) A particle moves along the curve $x = t^3 + 1$, $y = t^2$, $z = 2t + 3$, where t is the time. Find the components of its velocity and acceleration at $t = 1$ in the direction $i + j + 3k$. [5]

(*b*) Find the directional derivative of :

$$\phi = 5x^2y - 5y^2z + 2.5z^2x$$

at the point (1, 1, 1) in the direction of the line :

$$x - 1 = 3 - y = 2z.$$ [6]

(*c*) Show that :

$$\bar{F} = \left(y^2 - z^2 + 3yz - 2x\right)i + \left(3xz + 2xy\right)j + \left(3xy - 2xz + 2z\right)k$$

is both solenoidal and irrotational. [5]

Or

10. (*a*) Prove that (any *two*) :

(*i*) $\nabla\left(\nabla \cdot \frac{\bar{r}}{r}\right) = -\frac{2}{r^3}\bar{r}$

(*ii*) $\nabla \times \left[\left(\bar{r} \times \bar{a}\right) \times \bar{b}\right] = \bar{b} \times \bar{a}$

(*iii*) $\nabla \times \left[\bar{a} \times \nabla \log r\right] = \frac{2}{r^4}\left(\bar{a} \cdot \bar{r}\right)\bar{r}$.

(where $\bar{a}$ and $\bar{b}$ are constant vectors.) [6]

(*b*) Determine the constants a and b such that the vector :

$$\bar{F} = \left(2xy + 3yz\right)i + \left(x^2 + axz - 4z^2\right)j + \left(3xy + 2byz\right)k$$

is irrotational. [4]

(*c*) Find the directional derivative of the divergence of :

$$F(x, y, z) = xyi + xy^2j + z^2k$$

at the point (2, 1, 2) in the direction of the outer normal to the sphere $x^2 + y^2 + z^2 = 9$. [6]

11. (*a*) If

$$\bar{F} = 2xyzi + \left(x^2z + 2y\right)j + x^2yk,$$

then find the work done in moving a particle under this force field from (0, 1, 1) to (1, 2, 0). [5]

(*b*) Using Stokes' theorem, evaluate :

$$\int_C \left(xy\,dx + xy^2\,dy\right)$$

where C is the square with vertices (1, 0), (–1, 0), (0, 1), (0, –1). [6]

(*c*) Evaluate :

$$\iint_S \left(2xy\,i + yz^2\,j + 2z\,k\right) \cdot d\bar{S}$$

where S is the total surface of a region bounded by $x = 0$, $y = 0$, $z = 0$, $y = 3$ and $x + 2z = 6$. [6]

Or

12. (*a*) Evaluate :

$$\oint_C \left[\left(x^2 + 2y\right)dx + \left(4x + y^2\right)dy\right]$$

by Green's theorem, where C is the boundary of the region bounded by $y = 0$, $y = 2x$ and $x + y = 3$. [5]

(*b*) Using Stokes' theorem show that :

$$\oint_C \left(y\,dx + z\,dy + x\,dz\right) = -\iint_S \left(\cos\alpha + \cos\beta + \cos\gamma\right)dS$$

where α, β, γ are angle made by the normal to the surface S, with x, y, z axes respectively. [6]

(*c*) Show that the velocity potential :

$$\phi = \frac{a}{2}\left(x^2 + y^2 - 2z^2\right)$$

satisfies the Laplace's equation. Also determine the stream-lines. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1010

S.E. (Civil) (II Sem.) EXAMINATION, 2015

FLUID MECHANICS—I

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Define :

(*i*) Mass density

(*ii*) Specific gravity

(*iii*) Surface tension

(*iv*) Capillarity

(*v*) Specific weight

(*vi*) Specific volume. [6]

P.T.O.

(*b*) A circular plate 2.95 m diameter is immersed in water in such a way that its greatest and least depth below the free surface is 4.1 m and 1.6 m respectively. Determine the total pressure on one face of the plate and position of centre of pressure. [6]

Or

2. (*a*) State Buckingham's π theorem. Explain the procedure for solving problems by Buckingham's π theorem. [6]

(*b*) A rectangular pontoon is 5 m long, 3 m wide and 1.20 m high. The depth of immersion of the pontoon is 0.85 m in sea water. If the centre of gravity is 0.65 m above the bottom of the pontoon, determine the meta-centric height. Take density of sea water = 1025 kg/m^3. [6]

3. (*a*) Explain :

(*i*) Steady flow and Unsteady flow

(*ii*) Uniform flow and Non-uniform flow

(*iii*) Laminar flow and Turbulent flow. [6]

(*b*) Derive the Bernoulli's equation. Also mention the assumptions made for it. [6]

Or

4. (*a*) Explain rotation and vorticity. Derive the rotational components for three-dimensional flow. [6]

(*b*) A 20 cm × 10 cm venturimeter is inserted in a vertical pipe carrying oil of specific gravity 0.8, the flow of oil is in upward direction. The difference of levels between the throat and inlet section is 55 cm. The oil mercury differential manometer gives a reading of 33 cm of mercury. Find the discharge of oil in litres/s. Neglect losses. [6]

5. (*a*) Explain with neat sketches "Boundary layer separation and its control". [7]

(*b*) In case of laminar flow, through a circular pipe, show that ratio of maximum velocity to average velocity = 2.0. [6]

Or

6. (*a*) A fluid of viscosity 0.7 N.s/m^2 and specific gravity 1.3 is flowing through a circular pipe of diameter 100 mm. The maximum shear stress at the pipe wall is given as 196.2 N/m^2. Find :

(*i*) The pressure gradient

(*ii*) The average velocity

(*iii*) Reynolds number of the flow. [7]

(*b*) Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $\frac{u}{U} = \frac{y}{\delta}$, where u is the velocity at a distance y from the plate and u = U at $y = \delta$, where δ = boundary layer thickness. [6]

7. (*a*) Explain in brief :

(*i*) Instantaneous velocity

(*ii*) Temporal mean velocity

(*iii*) Scale of turbulance. [6]

(*b*) Derive the expression for "loss of head due to sudden enlargement" in case of flow through a pipe. [7]

Or

8. (*a*) Explain in brief with neat sketches :

(*i*) Prandtl's mixing length theory

(*ii*) Velocity distribution in turbulent flow. [6]

(*b*) The rate of flow of water through a horizontal pipe is 0.25 m^3/s. The diameter of the pipe which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is 11.772 N/cm^2. Determine :

(*i*) Loss of head due to sudden enlargement

(*ii*) Pressure intensity in the large pipe

(*iii*) Power lost due to enlargement. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**8**

Seat No.	

[4757]-1011

S.E. (Mech./Automobile) (First Semester)

EXAMINATION, 2015

ENGINEERING MATHEMATICS—III

(2012 COURSE)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Attempt Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of electronic pocket calculator is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Solve any *two* of the following : [8]

(*i*) $(D^2 + 9)\ y = x.\sin\ 2x$

(*ii*) $(D^2 - 6D + 13)\ y = e^{3x}.\sin\ 4x + 3^x$

(*iii*) $(D^2 + 4)\ y = \frac{1}{1 + \sin 2x}$,

(using method of variation of parameters.)

P.T.O.

(*b*) Using Fourier cosine integral of e^{-mx} $(m > 0)$ show that : [4]

$$\int_0^{\infty} \frac{m \cos \lambda x \ d\lambda}{m^2 + \lambda^2} = \frac{\pi}{2} . e^{-mx}, \ (m > 0, \ x > 0).$$

Or

2. (*a*) A body of weight "W = 20 N" is hung from a spring. A pull of "40 N" will stretch the spring to 10 cm. The body is pulled down to 20 cm below the static equilibrium position and then released. Find the displacement of the body from its equilibrium position in time '*t*' seconds. [4]

(*b*) Solve any *one* of the following : [4]

(*i*) Find the Laplace transform of

$$f(t) = \int_0^t \frac{\sin t}{t} \, dt .$$

(*ii*) Find the inverse Laplace transform of

$$F(s) = \log\left(\frac{s + 4}{s + 8}\right).$$

(*c*) Solve the following differential equation by using Laplace transform method : [4]

$$y''(t) + 9y(t) = 18t,$$

given that :

$$y(0) = 0, \quad y\left(\frac{\pi}{2}\right) = 1 .$$

3. (*a*) Calculate the first four moments about the mean of the given distribution : [4]

x	f
2.0	4
2.5	36
3.0	60
3.5	90
4.0	70
4.5	40
5	10

(*b*) Between 2 p.m. and 3 p.m. the average number of phone calls per minute coming into company are 3. Find the probability that during one particular minute there will be 2 or less calls. [4]

(*c*) Find the directional derivative of

$$\phi = xy^2 + yz^3$$

at (1, –1, 1) in the direction of tangent to the curve

$x = \sin t,\ y = \cos t,\ z = t$ at $t = \frac{\pi}{4}$. [4]

Or

4. (*a*) Find the coefficient of correlation for the following data : [4]

x	***y***
10	18
14	12
18	24
22	06
26	30
30	36

(*b*) Prove that (any *one*) : [4]

(*i*) $\nabla\left(\frac{\bar{a} \cdot \bar{r}}{r^n}\right) = \frac{\bar{a}}{r^n} - \frac{n\left(\bar{a} \cdot \bar{r}\right)}{r^{n+2}}\bar{r}$

(*ii*) $\nabla^4\left(r^2 \log r\right) = \frac{6}{r^2}$.

(*c*) Show that : [4]

$$\bar{F} = \left(6xy + z^3\right) i + \left(3x^2 - z\right) j + \left(3xz^2 - y\right) k$$

is irrotational. Find the scalar ϕ such that :

$$\bar{F} = \nabla\phi.$$

5. (*a*) Evaluate :

$$\int_C \bar{F} \cdot d\bar{r}$$

for

$$\bar{F} = 3x^2\bar{i} + (2xz - y)\bar{j} + z\bar{k}$$

along the curve :

$$x = 2t^2,\ y = t,\ z = 4t^2 - t$$

from $t = 0$ to $t = 1$. [4]

(*b*) Evaluate :

$$\iint_S \bar{F} \cdot d\bar{s}$$

where

$$\bar{F} = 4xz\bar{i} + xyz^2\bar{j} + 3z\bar{k}$$

and S is the surface of the cone :

$$z^2 = x^2 + y^2$$

bounded by $z = 4$. [5]

(*c*) Apply Stokes' theorem to calculate :

$$\int_C 4ydx + 2zdy + 6ydz,$$

where C is the curve of intersection of

$$x^2 + y^2 + z^2 = 6z$$

and $z = x + 3$. [4]

Or

6. (*a*) Evaluate :

$$\int_C \bar{F} \cdot d\bar{r}$$

for

$$\bar{F} = x^2\bar{i} + 2xy\bar{j} + z\bar{k}$$

and C is the straight line joining (1, 0, 2), (3, 1, 1). [4]

(*b*) Show that : [4]

$$\iint_S \frac{\bar{r}}{r^3} \cdot \hat{n}\, ds = 0 .$$

(*c*) Evaluate using Stokes' theorem : [5]

$$\int_C (ydx + zdy + xdz)$$

C being intersection of

$$x^2 + y^2 + z^2 = a^2, \; x + z = a.$$

7. (*a*) A string is stretched and fastened to two points l apart. Motion is started by displacing the string into the form

$$y = k(lx - x^2)$$

from which it is released at time $t = 0$. Find the displacement of any point on the string at a distance of x from one end at time t. Using differential equation : [7]

$$\frac{\partial^2 y}{\partial t^2} = C^2 \frac{\partial^2 y}{\partial x^2} .$$

(*b*) The temperature at any point of the insulated metal rod of one metre length is governed by the differential equation :

$$\frac{\partial u}{\partial t^2} = C^2 \frac{\partial^2 u}{\partial t^2}.$$

Find $u(x, t)$ subject to the following :

(*i*) $u(0, t) = 0°C$

(*ii*) $u(1, t) = 0°C$

(*iii*) $u(x, 0) = 50°C$. [6]

Or

8. (*a*) Solve the partial differential equation :

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

subject to boundary conditions :

(*i*) $u(0, y) = 0$

(*ii*) $u(x, 0) = 0$

(*iii*) $u(a, y) = 0$

(*iv*) $u(x, b) = 40$. [7]

(*b*) Use Fourier transform to solve the equation :

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, \quad 0 < x < \infty, \quad t > 0$$

subject to the following conditions :

(*i*) $u(0, t) = 0, \qquad t > 0$

(*ii*) $u(x, 0) = \begin{cases} 1 & 0 < x < 1 \\ 0 & x > 1 \end{cases}$

(*iii*) $u(x, t)$ is bounded. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-1012

S.E. (Mechanical/Automobile/Mechanical Sandwich)

(I Sem.) EXAMINATION, 2015

THERMODYNAMICS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Solve any *four* questions (Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8)**.

(*ii*) *All* the four questions should be solved in one answer book and attach extra supplement if required.

(*iii*) Draw neat and labelled diagrams whenever necessary.

(*iv*) Use of steam tables, Mollier charts, scientific calculator is allowed.

(*v*) Assume suitable data whenever necessary.

(*vi*) Figures to the right indicate full marks.

1. (*a*) State Kelvin-Planck and Clausius statement of the second law of thermodynamics and prove that the violation of Kelvin-Planck statement results into violation of Clausius statement. [6]

(*b*) In a certain heat exchanger, 50 kg of water is heated per minute from 50°C to 110°C by hot gases which enter the heat exchanger at 250°C. If the flow rate of gases is 100 kg/min, estimate the net change of entropy. Assume no loss of heat to surroundings. C_p(water) = 4.186 kJ/kg-K, C_p(gas) = 1 kJ/kg-K. [6]

P.T.O.

Or

2. (*a*) Derive expression for the following quantities for an ideal gas undergoing a constant temperature process : [6]

(*i*) Non-Flow System—Work done, Change in internal energy, Heat transfer

(*ii*) Flow System—Work done, Heat transfer, Entropy change.

(*b*) A heat engine working on Carnot cycle absorbs heat from three thermal reservoirs at 1000 K, 800 K and 600 K. The engine does 10 kW of net work and rejects 400 kJ/min. of heat to a heat sink at 300 K. If the heat supplied by the reservoir at 1000 K is 60% of the heat supplied by the reservoir at 600 K, make calculations for the quantity of heat absorbed by each reservoir. [6]

3. (*a*) State the assumptions made for air standard cycle. Derive an expression for the air standard efficiency and mean effective pressure of an Otto cycle. [6]

(*b*) Steam of mass 10 kg and pressure 1000 kPa, 0.85 dry, is heated at constant pressure till the volume is doubled. Determine :

(*i*) Final quality of steam

(*ii*) Heat added

(*iii*) Change in Internal Energy. [6]

Or

4. (*a*) Sketch and explain the construction and working of a separating and throttling calorimeter used for determining the dryness fraction of steam in a boiler. [6]

(*b*) A system at 450 K receives 225 kJ/s of heat energy from a source at 1500 K, and the temperature of both the system and source remains constant during the heat transfer process. Represent the process on temperature-entropy diagram and determine :

(*i*) Net change in entropy

(*ii*) Available energy of heat source and system

(*iii*) Decrease in available energy.

Take atmospheric temperature equal to 300 K. [6]

5. (*a*) Describe briefly the advantages which you would expect to be gained from incorporating an economizer, air preheater, and a superheated in a steam generating plant. By line diagram, indicate the position of these accessories in a typical boiler plant. [6]

(*b*) The following data relates to a trial on boiler using economizer, air preheater and superheater :

Condition of steam at exit of boiler = 20 bar, 0.96 dry

Temperature of steam at exit of superheater = 300°C

Steam evaporation rate/kg of fuel = 12 kg

Room temperature, t_0 = 25°C

Temperature of feed water at exit of economizer, t_1 = 50°C

Temperature of air at exit of air preheater, t_a = 70°C

The temperature of flue gases at inlet to superheater, economizer, air preheater and exit of air preheater are respectively 650°C, 430°C, 300°C and 180°C respectively.

Assume that air supplied is 19 kg/kg of fuel of calorific value of 45,000 kJ/kg, find :

(*i*) Equivalent evaporation with and without economizer, from and at 100°C.

(*ii*) Thermal efficiency of the boiler with and without economizer.

(*iii*) Thermal efficiency of superheater, economizer and air preheater. [7]

Or

6. (*a*) Define steam generator and write down the classification of boilers. [6]

(*b*) In a certain boiler installation, a steel chimney of 30 m height produces and natural draught equivalent to 17.75 mm of water

column. The mean temperature of the boiler house is 298 K and that of hot gases leaving the chimney is 633 K. If the boiler uses 1350 kg of coal per hour, make calculations for :

(*i*) Air supplied per kg of coal burnt on the grate,

(*ii*) Draught in terms of column of hot flue gases,

(*iii*) Density and mass flow rate of hot gas. [7]

7. (*a*) Define mass fraction and mole fraction with example and explain the method of writing the complete combustion equation of a C_8H_{18} with air. [6]

(*b*) A sample of coal supplied to a boiler has the following composition by mass :

Carbon = 87%, Hydrogen = 3%, Oxygen = 3%, Nitrogen = 1%, Sulphur = 1% and the remainder is ash. If 15% of excess air is supplied for combustion. Find :

(*i*) The theoretical amount of air required for complete combustion of fuel

(*ii*) The mass analysis of flue gas per kg of fuel. [7]

Or

8. (*a*) For what purpose a Bomb calorimeter is used ? Discuss its working with the help of a neat sketch. [6]

(*b*) The following data pertains to a test run made to determine the calorific value of a sample of coal :

Mass of coal burnt = 0.85 gm, Mass of fuel wire burnt and its calorific value is 0.028 gm and 6700 kJ/kg respectively, mass of water in calorimeter = 1800 gm, initial and final temperature of water = 16.5°C and 20.25°C, water equivalent of calorimeter = 350 gm, the coal contains 3% moisture by weight and R.T. = 20°C. Make calculations for the higher and lower calorific values of the coal sample. Consider latent heat of condensation of steam 2460 kJ/kg. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1013

S.E. (Mechanical & Automobile) (First Semester)

EXAMINATION, 2015

MANUFACTURING PROCESS—I

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) All the *four* questions should be solved in one answer-book and attach extra supplements if required.

(*ii*) Figures to the right indicate full marks.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of non-programable electronic pocket calculator is allowed.

(*v*) Assume suitable data, if necessary.

(*vi*) Solve Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**.

1. (*a*) Explain commonly used materials for pattern making with advantages and limitations. [6]

P.T.O.

(*b*) A slab of size 300 × 300 × 50 mm^3 is requires to cast from a molten steel using a top riser of 170 mm diameter. If (d/h) = 2 for riser, calculate the freezing ratio. [6]

Or

2. (*a*) Explain friction and lubrication in metal forming. [6]

(*b*) Explain types of rolling mills. [6]

3. (*a*) Explain submerged arc welding process. State the advantages and limitations of the process. [6]

(*b*) Explain extrusion of film. [6]

Or

4. (*a*) Write short note on edge preparation in welding. [6]

(*b*) Compare between TIG and MIG welding process. [6]

5. (*a*) Calculate the amount of shear on the punch to cut a hole of 60 mm diameter in 2 mm thickness plate. The ultimate shearing strength of plate material is 400 MPa. If the punching force is to be reduced to half of the force using a punch without shear. Assume percentage penetration 68%. [7]

(*b*) Write a note on strip layout. [6]

Or

6. (*a*) Explain with sketch type of pilots used in sheet metal working. [6]

(*b*) Find center of pressure for a MS part as shown in Fig. 6(b) with 1 mm thickness. Take ultimate shear strength of MS as 200 N/mm^2. [7]

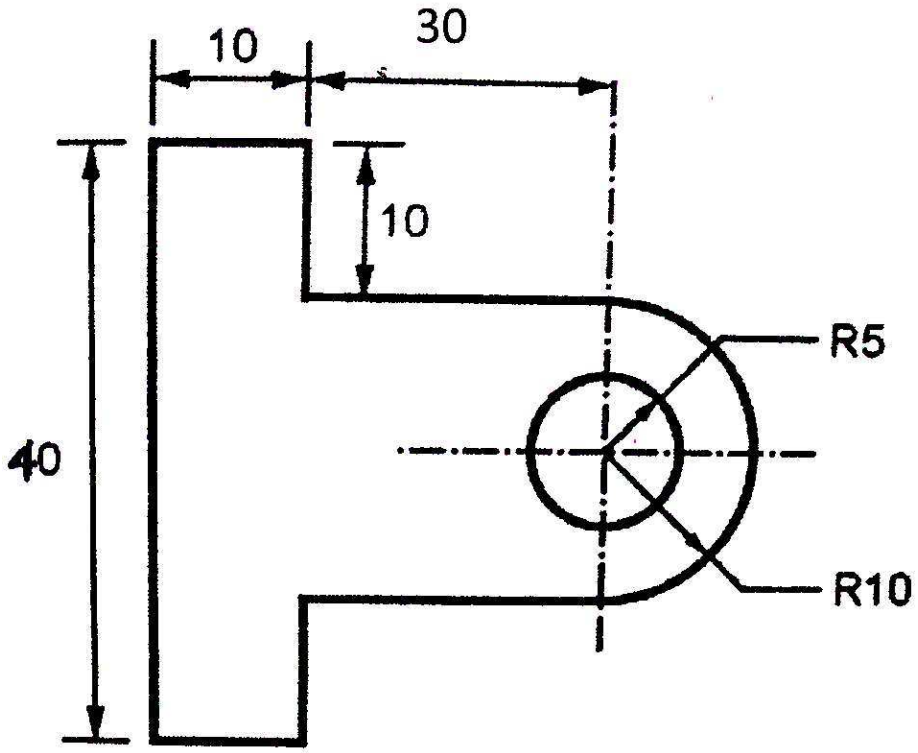


Fig. 6(b)

7. (*a*) With neat sketch explain back gear cone pulley type headstock. [7]

(*b*) Explain Half nut mechanism. [6]

Or

8. (*a*) Why lathe centres and mandrels are required while machining on lathe ? Also draw neat sketch of any two types of lathe centers and mandrels. [7]

(*b*) Calculate the angle by which compound rest will be swiveled when cutting a taper on a job with diameters 90 mm and 40 mm. Length of the job is 1.2 m. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1014

S.E. (Mechanical/Automobile)

(First Semester) EXAMINATION, 2015

FLUID MECHANICS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer *four* questions out of **8**.

(*ii*) Solve Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8.**

(*iii*) *All* the four questions should be solved in one answer-book and attach extra-supplements if required.

(*iv*) Draw diagrams wherever necessary.

(*v*) Use of scientific calculator is allowed.

(*vi*) Assume suitable data wherever necessary.

1. (*a*) State and prove Hydrostatic Law. [6]

(*b*) Discuss various types of flows. [6]

Or

2. (*a*) A body with gravity force of 500 N with a flat surface area of 0.2 m^2 slides down a lubricated inclined plane making a 30° angle with the horizontal. For viscosity of 0.1 kg.m/s and body speed of 1 m/s. Determine the lubricant film thickness. [6]

(*b*) Prove that streamlines and equipotential lines are orthogonal to each other. [6]

P.T.O.

3. (*a*) Derive an expression for Euler's equation along stream-line. [6]

(*b*) Write short notes on : [6]

(*i*) Hydrodynamically smooth and rough boundaries.

(*ii*) Velocity profile of Turbulent flow.

Or

4. (*a*) What is Pitot tube ? Derive expression for velocity. Draw with all labels Pitot static tube. [6]

(*b*) Derive expression for velocity distribution for flow in fixed parallel plates. [6]

5. (*a*) Derive an expression for Darcy-Weisbach equation. [6]

(*b*) Discharge Q of a centrifugal pump can be assumed to be dependent on density of liquid ρ, viscosity of liquid μ, pressure p, impeller diameter D, and speed N in RPM. Using Backingham π-theorem, show that : [7]

$$Q = ND^3\phi\left[\frac{gH}{N^2D^2}, \frac{v}{ND^2}\right].$$

Or

6. (*a*) What are repeating variables ? What points are important while selecting repeating variables ? [6]

(*b*) A siphon of dia. 200 mm connects two reservoirs having a a difference of elevation of 20 m. The total length of siphon is 800 m and the summit is 5 m above the water level in the upper reservoir. If separation takes place at 30 kPa (absolute). Find maximum length of siphon from upper reservoir to summit. Take friction factor = 0.016, P atm. = 10.3 m of water. [7]

7. (*a*) Derive an expression for displacement, momentum and energy thicknesses. [9]

(*b*) A car of frontal area 1.4 m^2 travels in still air with speed 72 kmph. If drag coefficient is 0.350, calculate power required to drive the car at this speed. Density of air is 1.2 kg/m^3. [4]

Or

8. (*a*) Discuss boundary layer development over flat plate. [7]

(*b*) Write a short note on "Flow around cylinder and aerofoil". [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1015

S.E. (Mechanical/Automobile) (First Semester)

EXAMINATION, 2015

MATERIAL SCIENCE

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Solve Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**.

(*ii*) Figures to the right indicate full marks.

(*iii*) Draw the neat sketch wherever necessary.

1. (*a*) What do you mean by the term 'Unit Cell' ? Define various lattice parameters. [4]

(*b*) Differentiate between cold working and hot working according to temperature, variation in mechanical properties, grain formation and areas of application. [4]

(*c*) What is composite material ? Explain with classification and types. [4]

Or

2. (*a*) What do you mean by the term 'Polymer' ? Explain with types, characteristics and applications. [4]

P.T.O.

(*b*) What do you mean by the term 'ceramic' ? Explain with types, properties and application. [4]

(*c*) Derive the expression for deformation of single crystal by slip ? State the condition for geometrical hardening and geometrical softening. [4]

3. (*a*) What is the concept of True stress and True strain ? Derive the relations between them also find out the condition for necking. [5]

(*b*) What do you mean by the term 'Hardness of the material' ? Explain any *four* testing methods for checking the hardness of the material. [4]

(*c*) What do you mean by 'non-destructive testing' ? Explain ultrasonic method of testing with working principle, advantages and drawbacks. [4]

Or

4. (*a*) Identify the methods of NDT in the following cases : [5]

(*i*) Cavities, cracks or region of variable density for the metal/ non-metallic components manufactured by casting, welding and forging etc.

(*ii*) To sort out dissimilar metals and detect differences in their composition, microstructure etc.

(*iii*) Detecting internal defects such as cracks, porosity and laminations in metallic and non-metallic components during or after production.

(*iv*) Various kinds of flows in ferromagnetic components made from various welding, castings and forging etc.

(*v*) Invisible cracks, porosity and other similar defects on the surface of components made up of metal, non-metal, plastic, glass etc.

(*b*) Explain with working principle the material test for the component which shows a plastic deformation under constant stresses for a longer time at high temperatures. Draw the type of possible microstructure during this test. [4]

(*c*) What is the purpose of 'Impact Test' ? Explain with types and the factors affecting the impact values of the component. [4]

5. (*a*) Define the term 'powder metallurgy' with steps of processing and classification of powder manufacturing processes. [5]

(*b*) What do you mean by the term 'sintering' ? Explain the stages of sintering. [4]

(*c*) Explain the role of powder metallurgy for manufacturing of 'cemented carbide' ? [4]

Or

6. (*a*) Explain powder metallurgy with characteristics of metal powders, advantages, disadvantages and areas of applications. [5]

(*b*) What do you mean by conditioning of metal powders ? Explain with purpose and different processing stages. [4]

(*c*) What is a 'self-lubricated bearing' ? Explain the role of powder metallurgy for manufacturing of 'self-lubricated bearings'. [4]

7. (*a*) Explain the following terms (any *two*) : [4]

(*i*) Piezometric materials

(*ii*) Soft and hard ferrites

(*iii*) Super-conductors.

(*b*) What do you mean by the term 'biomaterials' ? Explain with different types ? [4]

(*c*) Explain the concept of 'shape memory alloy' with advantages, disadvantages and applications. [4]

Or

8. (*a*) Explain the following terms (any *two*) : [4]

(*i*) Cryogenic applications of smart materials

(*ii*) Modern materials for high temperature applications

(*iii*) Dielectric materials.

(*b*) Explain the concept of nano-science and technology. [4]

(*c*) Explain 'Biosensors' with principle, advantages and applications. [4]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1016

S.E. (Mechanical, Mechanical Sandwich, Automobile)

(Second Semester) EXAMINATION, 2015

ELECTRONICS AND ELECTRICAL ENGINEERING

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8.**

(*ii*) Figures to the right side indicate full marks.

(*iii*) Assume suitable data if necessary and state the same clearly.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Use of electronic pocket calculator is allowed.

1. (*a*) Explain TMOD register and specify its operating modes. [6]

(*b*) Explain different addressing modes supported by 8051 microcontroller. [6]

Or

2. (*a*) What is Program Status Word (PSW) ? State the function of each flag in it. [6]

(*b*) Discuss asynchronous and synchronous data transfer formats. [6]

P.T.O.

3. (*a*) Derive the expression for the torque developed in a three-phase induction motor under running conditions. Hence state the equation for maximum torque developed. [6]

(*b*) A 200 V, 4 Pole, Lap wound DC shunt motor has 800 conductors on its armature. The resistance of armature winding is 0.5 Ω and that of shunt field winding is 200 Ω. The motor takes current of 21 A and flux per pole is 30 MWb. Find the speed and gross torque developed in armature. [7]

Or

4. (*a*) Explain V/f control method for controlling speed of three-phase induction motor. [6]

(*b*) Draw and explain characteristics of DC shunt and series motors. [7]

5. (*a*) Discuss advantages of digital voltmeters over analog voltmeters. Also mention its limitations. [6]

(*b*) Explain working of conventional standard signal generator with the help of neat diagram. [6]

Or

6. (*a*) Explain working of digital multimeter with the help of block diagram. [6]

(*b*) Enlist applications of Cathode Ray Oscilloscope (CRO) for measurement of various electrical quantities. [6]

7. (*a*) Explain two wattmeter method used for measuring three-phase power in a star connected balanced load supplied by symmetrical a.c. with the help of neat connection diagram and phasor diagram. [6]

(*b*) What is an AC bridge ? Enlist AC bridges. Derive the general equations for balance of an AC bridge. [7]

Or

8. (*a*) Two wattmeters are connected to measure total power in a three-phase circuit. One reads 4800 W while the other reads backwards. Over reversing the connections of the later, it reads 400 W. Find total power absorbed and power factor of circuit. [6]

(*b*) What is Wien's bridge ? Derive the expression for unknown frequency in terms of bridge parameters. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-1017

S.E. (Automobile/Mechanical Engineering)

(Second Semester) EXAMINATION, 2015

APPLIED THERMODYNAMICS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Assume suitable data, if necessary.

(*iii*) Draw neat diagrams wherever necessary.

(*iv*) Figures to the right indicate full marks.

1. (*a*) Explain with the help of a P–V diagram the loss due to variation of specific heats in an Otto cycle. [6]

(*b*) With a neat sketch explain the working principle of simple carburetor. [6]

Or

2. (*a*) Draw ideal and actual valve timing diagram for four stroke S.I. engine. [6]

(*b*) Explain the different stages of combustion in S.I. engine. [6]

P.T.O.

3. (*a*) Explain the various factors that influence the delay period in C.I. engine. [6]

(*b*) In a test of a four–cylinder four-stroke petrol engine of 75 mm bore and 100 mm stroke, the following results were obtained at full throttle at a constant speed and with a fixed setting of the fuel supply of 0.082 kg/min. :

BP with all cylinders working = 15.24 kW

BP with cylinder No. 1 cut-off = 10.45 kW

BP with cylinder No. 2 cut-off = 10.38 kW

BP with cylinder No. 3 cut-off = 10.23 kW

BP with cylinder No. 4 cut-off = 10.45 kW

Estimate :

(1) Total indicated power of the engine

(2) Total friction power,

(3) Indicated thermal efficiency of the engine

If the calorific value of the fuel is 44 MJ/kg [7]

Or

4. (*a*) Explain with figures various types of combustion chambers used in CI engines. [6]

(*b*) During the trial of a single cylinder, four-stroke oil engine, the following results were obtained : [7]

Cylinder diameter	= 20 cm
Stroke	= 40 cm
Mean effective pressure	= 6 bar
Torque	= 407 Nm
Speed	= 250 r.p.m.
Fuel consumption	= 4 kg/h
Calorific value of fuel	= 43 MJ/kg
Cooling water flow rate	= 4.5 kg/min
Air used per kg of fuel	= 30 kg of air/kg of fuel
Rise in cooling water temperature	= 45°C
Temperature of exhaust gases	= 420°C
Room temperature	= 20°C
Mean specific heat of exhaust gas	= 1 kJ/kgK
Specific heat of water	= 4.18 kJ/kgK

Find IP, BP and draw heat balance sheet for the test.

5. (*a*) Explain with neat sketch pressurized dry sump lubrication system. [6]

(*b*) Discuss the effect of A : F ratio on emission of : [6]

(1) Unburnt HC

(2) CO

(3) NO_x.

Or

6. (*a*) Explain battery ignition system with neat diagram. [6]

(*b*) Explain exhaust gas recirculation method used to control NO_x emissions. [6]

7. (*a*) What are the advantages of multi-staging in reciprocating air compressor ? [6]

(*b*) During an experiment on reciprocating air compressor the following observations are being taken : [7]

Barometer reading	= 75.6 cm Hg
Manometer reading across orifice	= 13 cm Hg
Atmospheric temperature	= 25°C
Diameter of orifice	= 15 mm
Coefficient of discharge across the orifice	= 0.65
Take density of Hg	= 0.0135951 kg/cm^3

Determine the volume of free air handled by compressor in m^3/min.

Or

8. (*a*) Draw isothermal, polytrophic and isentropic compression on P-V and T-s diagram and compare the three works. [6]

(*b*) Determine the minimum number of stages required in an air compressor which admits air at 1 bar 27°C and delivers at 180 bar. The maximum discharge temperature at any stage is limited to 150°C. Consider the index for polytropic compression as 1.25 and perfect and optimum inter-cooling in between the stages. Neglect the effect of clearance. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-1018

S.E. (Mechanical/Automobile) (Second Semester)

EXAMINATION, 2015

STRENGTH OF MATERIALS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer *four* questions out of **8**.

(*ii*) Solve Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**.

(*iii*) All the four questions should be solved in one answer-book; attach extra supplements if required.

(*iv*) Draw diagrams wherever necessary.

(*v*) Use of scientific calculator is allowed.

(*vi*) Assume suitable data wherever necessary.

1. (*a*) A steel bar 25 mm diameter and length 250 mm is pulled by 0.001 mm by application of tensile load. Find the diameter of the bar if the linear strain is to be reduced by 10% without changing the load. [6]

P.T.O.

(*b*) Draw SFD and BMD for the beam loaded as shown in figure below. [6]

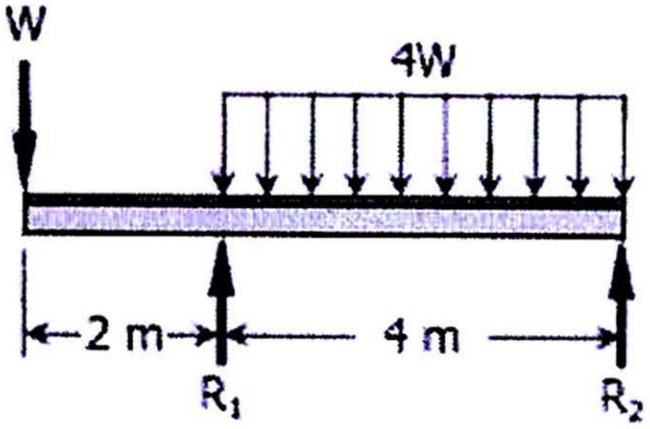


Fig. 1

Or

2. (*a*) A steel bar of 35 mm diameter and length 350 mm is pulled by 0.002 mm by application of tensile load. If the diameter of the bar is changed to 30 mm find the change in length for the same load. [6]

(*b*) Draw SFD and BMD for the beam loaded as shown in figure below. [6]

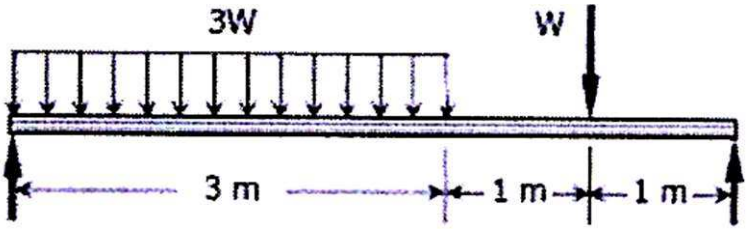


Fig. 2

3. (*a*) A rectangular steel bar, 15 mm wide by 30 mm high and 6 m long, is simply supported at its ends. If the density of steel is 7850 kg/m^3, determine the maximum bending stress caused by the self-weight of the bar. [6]

(*b*) Determine the deflection at the free end of a cantilever of length 4 m carrying a uniformly distributed load of 12 kN/m over a length of 3 m from fixed end. [6]

Take EI = 2 × 10^{13} N/mm^2.

Or

4. (*a*) Determine the minimum height *h* of the beam shown in figure below if the flexural stress is not to exceed 20 MPa. [6]

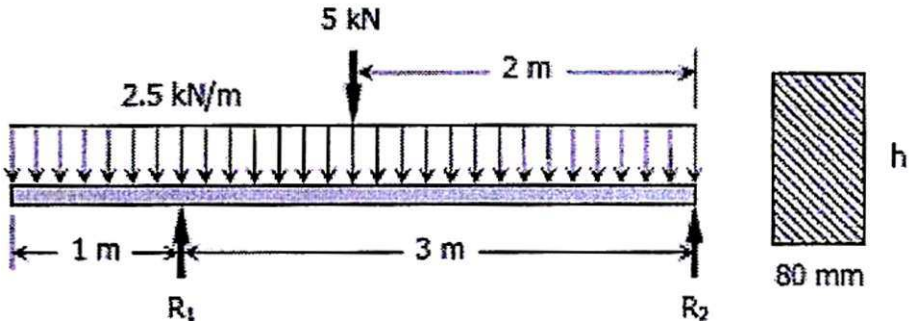


Fig. 3

(*b*) For the problem described in question 3(*b*) determine the slope at the free end of the cantilever. [6]

5. (*a*) A hollow steel shaft 1 m long is required to transmit a torque of 10 kN-m. The total angle of twist in this length is not to exceed 1° and the allowable shearing stress is 100 MPa. Determine the inside and outside diameter of the shaft if G = 100 GPa. [6]

(*b*) Determine the ratio of the buckling strenghts of a solid steel column to that of a hollow column of same material and having same cross-sectional area. The internal diameter of hollow column is half of its external diameter. Both the columns are of the same length and are pinned at both ends. [7]

Or

6. (*a*) A steel bar of rectangular cross-section 33 mm × 66 mm and pinned at each end is subject to axial compression. If the proportional limit of the material is 330 MPa and E = 222 GPa, determine the minimum length for which Euler's equation may be used to determine the buckling load. [6]

(*b*) A hollow shaft of diameter ratio 3/5 is required to transmit 482 kW at 125 rpm. The shearing stress in the shaft must not to exceed 65 N/mm^2 and the twist in a length of 2 m not to exceed 1 degree. Calculate minimum external diameter of shaft which would satisfy these conditions.[7] Take $G = 8 \times 10^4$ N/mm^2.

7. A solid circular shaft is subjected to a bending moment of 8 kNm and a torque of 12 kNm. In a uniaxial test the shaft material gave the following results : Modulus of elasticity = 200 GN/m^2, Stress at yield point = 300 N/mm^2, Poisson's ratio = 0.3, Factor of safety = 3. Estimate the least diameter of the shaft using :

(*i*) Maximum principal stress theory

(*ii*) Maximum principal strain theory and

(*iii*) Shear strain energy theory. [13]

Or

8. A material is subjected to two mutually perpendicular direct stresses of 92 MPa tensile and 29 MPa compressive, together

with a shear stress of 22 MPa. The shear couple acting on planes carrying the 92 MPa stress is clockwise in effect. Calculate :

(*i*) magnitude and nature of the principal stresses;

(*ii*) magnitude of the maximum shear stresses in the plane of the given stress system;

(*iii*) direction of the planes on which these stresses act. [13]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-1019

S.E. (Mech./Mech. Sand./Auto.) (Second Semester)

EXAMINATION, 2015

THEORY OF MACHINES—I

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Define 'Inversion'. Explain with the help of neat sketches any *two* inversions of double slider crank chain. [5]

(*b*) Write a note on 'Dynamically Equivalent System'. [5]

Or

2. (*a*) Compare 'Davis' and 'Ackermann' Steering Gear Mechanisms. [4]

(*b*) With the help of neat schematic diagram, derive frequency equation of bifilar suspension system. [6]

P.T.O.

3. (*a*) Determine the dimensions of the contact surfaces of cone clutch, for the following specifications : [5]

(*i*) Power transmission capacity = 20 kW

(*ii*) Speed = 1600 rpm

(*iii*) Cone angle = 30°

(*iv*) Maximum intensity of pressure = 0.8×10^5 N/m^2

(*v*) Coefficient of friction = 0.3

(*vi*) Mean radius is twice the width of the friction surface. Assume uniform wear condition.

(*b*) Explain Complex Algebra method of acceleration analysis for a binary link. [5]

Or

4. (*a*) Describe with neat sketch the construction and working of epicyclic train type dynamometer. [5]

(*b*) Derive an equation for velocity of piston in an I.C. engine mechanism, when crank rotates with uniform angular velocity using analytical method. [5]

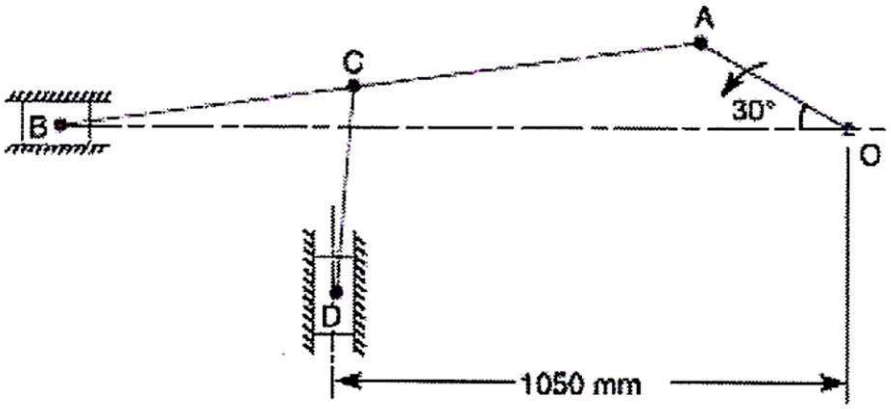
5. (*a*) State and explain Kennedy's theorem. [4]

(*b*) In the mechanism shown in Fig. 1, the crank OA rotates at 20 rpm in anticlockwise direction and gives motion to the sliding blocks B and D. For the given configuration of mechanism, determine by relative velocity method and relative acceleration method : [11]

(*i*) Velocity of sliders B and D

(*ii*) Angular velocity of link CD

(*iii*) Acceleration of sliders B.



OA = 300 mm, AB = 1.2 m, BC = CD = 450 mm

Fig. 1 (for Q. No. 5 (*b*) and Q. No. 6(*b*))

Or

6. (*a*) With the help of neat sketch, explain the concept of 'Velocity Image Principle'. [4]

(*b*) In the mechanism shown in Fig. 1 the crank OA rotates at 20 rpm in anticlockwise direction and gives motion to the sliding blocks B and D. For the given configuration of mechanism, locate all instantaneous centers of rotation, then determine :

(*i*) Velocity of sliders B and D

(*ii*) Angular velocities of links AB and CD. [11]

7. (*a*) What is Coriolis acceleration ? Find the direction of this acceleration in the case shown in Fig. 2. [4]

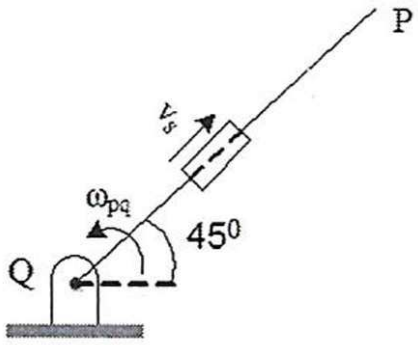


Fig. 2 (For Q. 7(a))

(*b*) The crank of an engine is 180 mm long and obliquity ratio is 4. Determine the velocity and acceleration of the piston, when the crank is turned through 40° from I.D.C. position for the following two cases : [11]

(*i*) The crank rotates at a uniform speed of 300 rpm

(*ii*) The crank rotates at a speed of 300 rpm and is increasing at the rate of 120 rad/s^2.

Or

8. (*a*) Explain the procedure to construct Kleins construction to determine the velocity and acceleration of a piston an I.C. engine mechanism, when crank rotates at a uniform angular velocity. [4]

(*b*) The driving crank AB of length 75 mm for the quick return mechanism, as shown in Fig. 3 revolves at a uniform speed of 200 rpm. Find acceleration of point Q, for the configuration shown, when the crank makes an angle of 60° with the vertical line of centers PA. [11]

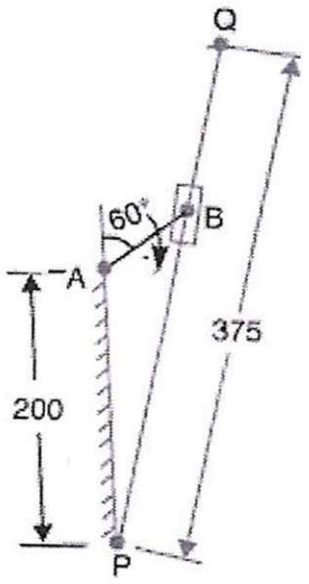


Fig. 3 (For Q. 8(b))

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-102

S.E. (Civil) (First Semester) EXAMINATION, 2015

BUILDING MATERIALS AND CONSTRUCTION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the *two* sections should be written in separate answers books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Assume suitable data, if required.

Section I

1. (*a*) It is proposed to construct a residential building on black cotton soil. As a civil engineer; you have two choices, isolated column footing and pile foundation. Comment with reason, which you would select. [6]

P.T.O.

(*b*) Explain the following with neat sketches : [6]

(*i*) DPC

(*ii*) QC

(*iii*) Bed

(*iv*) Frog.

(*c*) Compare Stone masonry and Brick masonry. [4]

Or

2. (*a*) Compare English and Flemish bond with sketch of plan. [6]

(*b*) Explain the following with neat sketches : [6]

(*i*) Plinth

(*ii*) Pointing

(*iii*) Bond

(*iv*) Foundation.

(*c*) State the circumstances where mat foundation and strap footing is used. [4]

3. (*a*) Write short notes on : [6]

(*i*) Laying of block

(*ii*) Cavity wall.

(*b*) Draw neat and labelled sketch of form-work for combined beam and slab. [6]

(*c*) Define composite masonry. State the advantages of it. [4]

Or

4. (*a*) Write short notes on : [6]

(*i*) Reinforced brick lintel

(*ii*) Composite masonry.

(*b*) Explain the detailed procedure of manufacturing of concrete blocks. [6]

(*c*) State the ideal requirements of formwork. [4]

5. (*a*) State any *four* flooring tiles available in market. Write down their advantages only. [6]

(*b*) Explain the following with sketch : [6]

(*i*) couple roof

(*ii*) dado

(*iii*) purlin

(*iv*) post plate.

(*c*) Draw neat and labelled sketch of king-post truss. [6]

Or

6. (*a*) Describe the construction of wooden flooring. [6]

(*b*) Explain the following with sketch : [6]

(*i*) collar roof

(*ii*) ridge

(*iii*) skirting

(*iv*) common rafter.

(*c*) Draw neat and labelled sketch of Queen post truss. [6]

Section II

7. (*a*) List the different types of windows used in construction industry. Explain any *one* in detail with a sketch. [6]

(*b*) Enlist various types of plastering. Explain lime plaster in detail. [6]

(*c*) Define an Arch. Draw a semi-circular arch and label the different components of the semi-circular arch. [6]

Or

8. (*a*) Draw a panelled foor (with dimensions) and mention all the components of door. [6]

(*b*) Write a short note on "Louvered Doors and Windows". [6]

(*c*) Define Scaffolding and explain any *one* type of Scaffolding with a neat figure. [6]

9. (*a*) It is proposed to locate a stair in a staircase measuring 3 m × 5 m. Height of the floor is 3.5 m. Design a staircase and draw a plan of the staircase with the relevant details. (Assume the data wherever required). [6]

(*b*) State the safety measures to be taken during the construction of a skyscraper. [6]

(*c*) Explain the method of storage for the following materials : [4]

(*i*) Cement

(*ii*) Steel.

Or

10. (*a*) Write a short note on "Vertical Circulation in Buildings". [6]

(*b*) List different types of staircase. Explain spiral staircase. [6]

(*c*) Enlist the general fire-safety measures to be adopted for a building. [4]

11. (*a*) List minimum two building components where each of the following building materials is used : [6]

(*i*) Glass

(*ii*) Timber

(*iii*) Plaster of Paris.

(*b*) Explain Seasoning of Timber. Describe any *one* method of seasoning of timber. [6]

(*c*) Write a short note on Bamboo as a eco-friendly material in construction. [4]

Or

12. (*a*) Explain the engineering properties of : [6]

(*i*) Plastic

(*ii*) Glass.

(*b*) Write a short note on Ceramics and its applications in construction industry. [6]

(*c*) Write a note on "Eco-friendly Flooring". [4]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1020

S.E. (Mechanical and Automobile) (Second Semester)

EXAMINATION, 2015

ENGINEERING METALLURGY

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer any *four* questions. Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** and Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Use of electronic pocket calculator is allowed.

(*iv*) Figures to the right indicate full marks.

1. (*a*) Define the following : [4]

(*i*) Phase

(*ii*) Ledeburite

(*b*) What is "isomorphous" system ? Explain with *one* example of the same. [4]

(*c*) Draw Fe-Fe_3C phase diagram and write the critical temperatures on it. [4]

P.T.O.

Or

2. (*a*) What is stainless steel ? For surgical applications which group of stainless steel is used ? Explain in detail. [4]

(*b*) Draw a self-explanatory cooling curves for binary eutectic. [2]

(*c*) With a neat diagram explain working of metallurgical microscope. [4]

(*d*) What do you understand by AISI 1090 and Fe-230. [2]

3. (*a*) While selecting any material in corrosion, what are the different factors taken into consideration ? [6]

(*b*) Write a short note on Nitriding. [4]

(*c*) Explain strain hardening is one of best strengthening mechanism for pure metal. [3]

Or

4. (*a*) A large size gear needs to be hardened, suggest a suitable heat treatment for the same and justify your answer. [3]

(*b*) What is Crevice corrosion ? How it can be reduced ? [3]

(*c*) Explain in brief "Impressed current cathode protection". [3]

(*d*) Show the following heat treatment on TTT diagram : [4]

(*i*) Austempering

(*ii*) Conventional Hardening.

5. (*a*) In which cast iron, carbon is not present in the free form ? Explain the treatment ? Which converts cementite into free carbon-graphite. Draw the microstructure after heat treatment. [6]

(*b*) What is mottled cast iron ? Why the formation of this cast iron is avoided ? [4]

(*c*) Discuss advantages of gray cast iron over white cast iron. [3]

Or

6. (*a*) Write True or False and justify your answer : [6]

(*i*) Chilled cast iron can be used for manufacturing wheels of road rollers.

(*ii*) Gray cast iron is used for manufacturing bearings.

(*b*) Draw a microstructure of ferritic "gray cast iron". [2]

(*c*) What is Ni-Resist cast iron ? How does it differ from Nicrosilal ? [5]

7. (*a*) Give the composition of "Duralumin". What are its properties ? [4]

(*b*) What is "Naval Brass" ? What are its applications ? [4]

(*c*) How "Invar" differs from "Elinvar" ? Compare their compositions and give *one* application of each. [4]

Or

8. (*a*) What properties are required for bearing materials ? Give composition of any *one* non-Ferrous alloy used as bearing. [4]

(*b*) Give typical composition, properties, applications of the following (any *two*) : [6]

(*i*) Cap Brass

(*ii*) Statuary Bronze

(*iii*) Muntz metal

(*iv*) Leaded brass

(*c*) What is Zinc equivalence in brass ? [2]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1023

S.E. (Mechanical Sandwich) (Second Semester)

EXAMINATION, 2015

METROLOGY AND QUALITY CONTROL

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Solve Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**.

(*iii*) Assume suitable data, if necessary.

(*iv*) Use of calculator is allowed.

(*v*) Figures to the right indicate full marks.

1. (*a*) State different types of linear and angular measuring instruments, explain any *two* with example. [6]

(*b*) State different types of comparators, explain sigma comparator in detail. [6]

P.T.O.

Or

2. (*a*) State and explain Taylor's Principle of Gauge Design with example. [6]

(*b*) What is surface texture ? State different methods to analyze surface trace. [6]

3. (*a*) Explain method of measuring effective diameter by using two wires. [6]

(*b*) Explain Pareto analysis and Fish bone diagram in detail. [6]

Or

4. (*a*) Explain CMM and UMM in detail. [6]

(*b*) What are different quality costs ? Explain with examples. [6]

5. (*a*) What is TPM ? Explain eight pillars of TPM. [7]

(*b*) Explain the concept of zero defects. [3]

(*c*) Explain the concept of JIT. [3]

Or

6. (*a*) Write short notes on (any *two*) : [8]

(*i*) Quality function deployment (QFD) in TQM

(*ii*) Poka-yoke

(*iii*) Kanban.

(*b*) Explain ISO-9000 quality system standards. [5]

7. (*a*) Table given below shows the number of defectives found in inspection of 10 lots of 100 items each : [7]

Lot No.	**No. of defective**
1	5
2	2
3	2
4	3
5	4
6	1
7	13
8	4
9	3
10	4

(*i*) Determine the control limits for P chart and state whether the process is in control.

(*ii*) If the points that goes outside the control limits is analyzed and eliminated, what will be the value of new control limit ?

(*b*) Differentiate between single, double and sequential sampling plan. [6]

Or

8. (*a*) Define AOQL and AOQ. For the following data, calculate the sample size and AOQ for single sampling plan. [7]

(*i*) Probability of acceptance for 0.4% defectives in a lot is 0.558

(*ii*) Lot size N = 15000 units

(*iii*) np' = 1.6

(*iv*) Defective found in the sample are not to be replaced.

(*b*) Explain control chart for variables with specification limits. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-1024

S.E. (Mechanical Sandwich)

(First Semester) EXAMINATION, 2015

FLUID MECHANICS AND MACHINERY

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Answers should be written in same answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Your answers will be valued as a whole.

(*vi*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vii*) Assume suitable data, if necessary.

1. (*a*) Define path line, streak line and the streamline. For what type of flow these lines are identical ? [4]

(*b*) A sqaure plate 50 cm × 50 cm weighing 200 N is allowed to slide down an inclined plane which is laid at a slope of 1 vertical to 2.5 horizontal. What terminal velocity will be attained by the plate if 0.02 mm thickness of oil film lies interposed between the inclined plane and the plate ? The oil has a dynamic viscosity of 2.25×10^{-3} Ns/m^2. [8]

P.T.O.

Or

2. (*a*) Check whether the following functions satisfies continuity and is valid potential function : [6]

(*i*) $\phi = \frac{A}{2}(x^2 - y^2)$

(*ii*) $\phi = A(\cos x + \sin y)$

(*iii*) $\phi = A \log_e xy$

where, A is numerical constant.

(*b*) A block of wood of specific gravity 0.7 floats in a water. Determine the meta-centric height of the block if its size is 2 m long × 1 m wide × 0.8 m deep. [6]

3. (*a*) Define Orifice-meter. Prove that the discharge through an orifice-meter is given by the relation : [5]

$$Q = C_d \frac{a_0 a_1}{\sqrt{a_1^2 - a_0^2}} \sqrt{2gh}$$

where :

a_1 = Area of pipe in which orifice-meter is fitted

a_0 = Area of orifice.

(*b*) A Pelton wheel is to be designed for the following specifications : [8]

Shaft power = 11,772 kW, Head = 380 meters, Speed = 750 RPM, Overall efficiency = 86%, Jet diameter is not to exceed one-sixth of the wheel diameter. Determine :

(*i*) The wheel diameter

(*ii*) The number of jets required and

(*iii*) Diameter of the Jet.

Take $K_{v1} = 0.985$ and $K_{u1} = 0.45$.

Or

4. (*a*) A main pipe divides into two parallel pipes which again forms one pipe. The length and diameter for the first parallel pipe are 2000 m and 1.0 m respectively, while the length and diameter of 2nd parallel pipe are 2000 m and 0.8 m. Find the rate of flow in each parallel pipe, if total flow in the main is 3.0 m^3/s. The co-efficient of friction for each parallel pipe is same and equal to 0.005. [9]

(*b*) Obtain the expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet. [4]

5. (*a*) Using Buckingham's π-theorem, show that the discharge Q consumed by an oil ring is given by : [10]

$$Q = N d^3 \phi \left[\frac{\sigma}{\rho N^2 d^3}, \frac{\mu}{\rho N d^2}, \frac{w}{\rho N^2 d} \right]$$

where :

d = internal diameter of the ring,

N = rotational speed,

ρ = density,

μ = viscosity,

σ = surface tension and w = sp. weight of oil.

(*b*) What is a draft-tube ? What are its functions ? [3]

Or

6. (*a*) What is cavitation ? How can it be avoided in reaction turbine ? [3]

(*b*) The hub diameter of a Kaplan Turbine working under a head of 12 m is 0.35 times the diameter of the runner. The turbine is running at 100 r.p.m. If the vane angle of the extreme edge of the runner at outlet is 15° and flow ratio 0.6, find : [10]

(*i*) Diameter of the runner

(*ii*) Diameter of the boss and

(*iii*) Discharge through the runner.

The velocity of whirl at outlet is given as zero.

7. The outer diameter of an impeller of a centrifugal pump is 400 mm and outlet width is 50 mm. The pump is running at 800 rpm and is working against a total head of 15 m. The vanes angle at outlet is 40° and Manometric efficiency is 75% Calculate : [12]

(*i*) Velocity of flow at outlet

(*ii*) Velocity of water leaving the vane

(*iii*) Angle made by the absolute velocity at outlet with the direction of motion at outlet, and

(*iv*) Discharge.

Or

8. A centrifugal pump with 1.2 m diameter runs at 200 r.p.m. and pumps 1800 liters/s, the average lift being 6 m. The angle which the vanes make at exit with the tangent to the impeller is 26° and the radial velocity of flow is 2.5 m/s. Determine the Manometric efficiency and the least speed to start pumping against a head of 6 m, the inner diameter of the impeller being 0.6 m. [12]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1025

S.E. (Mechanical Sandwich) (First Semester) EXAMINATION, 2015
MATERIAL SCIENCE AND METALLURGY
(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Solve any *four* questions Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) All the *four* questions should be solved in one answer-book and attach extra supplements if required.

(*iii*) Draw neat and labelled diagrams wherever necessary.

(*iv*) Assume suitable data wherever necessary.

(*v*) Figures to the right indicate full marks.

1. (*a*) Explain with a schematic illustration, the relation between tensile stress and resolved shear stress during loading of single crystal. [4]

(*b*) What is fatigue ? How can fatigue strength be improved ? [4]

(*c*) What are the different methods to increase corrosion resistance of a metallic material ? [5]

P.T.O.

Or

2. (*a*) Explain in brief "Radiography" technique for detecting defects in the components. [5]

(*b*) Differentiate between Vickers and Brinell hardness test. [4]

(*c*) What is Strain Hardening ? How does it improve the strength of materials ? [4]

3. (*a*) Explain the difference between Cast Irons and Steel. [4]

(*b*) What is "Austempering" ? What are its advantages ? [4]

(*c*) In which cast Iron "Rosettes of Temper Carbon" are observed ? Explain that treatment. [4]

Or

4. (*a*) What is the meaning of the following designation for cast iron and steel ? [4]

(*i*) AISI

(*ii*) EN

(*iii*) SAE

(*iv*) ISI.

(*b*) Draw and label a microstructure of slowly cooled, eutectoid plain carbon steel. [4]

(*c*) Explain "Flame Hardening" Heat treatment. [4]

5. (*a*) What is 'Y' alloy ? What are its properties and applications ? [4]

(*b*) What is "Gun Metal" ? What are its properties and applications ? [4]

(*c*) Explain "Cemented Carbides". [5]

Or

6. (*a*) Explain in brief "Powder Conditioning". [4]

(*b*) What is Invar ? What are its properties and applications ? [4]

(*c*) Differentiate between α-Titanium alloy and β-Titanium alloy. [5]

7. (*a*) What are "F.R.P" materials ? Give their *two* applications. [4]

(*b*) What are "Refractory Ceramics" ? Give *two* examples of common ceramic refractory materials. [4]

(*c*) How does "Condensation polymerization" differ from "addition polymerization" ? [4]

Or

8. (*a*) What are ceramic matrix composites ? Explain with *one* example. [4]

(*b*) Explain in brief "sandwich panels". [4]

(*c*) How are "cerements" prepared ? Explain its properties and applications. [4]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1027

S.E. (Mechanical S/W) (Second Semester) EXAMINATION, 2015

MANUFACTURING ENGINEERING

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) *All* the *four* questions should be solved in one answer-book and attach extra supplements if required.

(*ii*) Figures to the right indicate full marks.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of non-programmable electronic pocket calculator is allowed.

(*v*) Assume suitable data, if necessary.

(*vi*) Solve Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

1. (*a*) Explain moulding machines along with advantages and limitations. [6]

(*b*) Explain the types of adhesives and application. [6]

P.T.O.

Or

2. (*a*) Explain with sketch Swaging process. [6]

(*b*) Explain types of flames. [6]

3. (*a*) Calculate index crank movement to divide 57 division by using compound indexing. The hole circles available are : [6]

Plate I : 15, 16, 17, 18, 19, 20

Plate II : 21, 23, 27, 29, 31, 33

Plate III : 37, 39, 41, 43, 47, 49

(*b*) Draw merchant force circle and only state relation between these forces. (Do not derive force relation) [6]

Or

4. (*a*) State various lathe attachments and explain *one* with neat sketch. [6]

(*b*) Explain with neat sketch PAM, state commonly used gas or mixtures in PAM. [6]

5. (*a*) State types and explain with sketch pilots. [6]

(*b*) Describe the following die accessories with sketch : [7]

(*i*) Stock stop

(*ii*) Stripper.

Or

6. (*a*) Explain how material is cut in punch and die setup, also effect of clearance on this cutting. [7]

(*b*) Determine Force required for Banking a square plate having its side 60 mm and have a central hole of diameter 15 mm. The sheet metal thickness is 3 mm and shear strength of material is 380 N/mm^2. Show die and punch dimensions. Consider clearance of 10% of stock thickness. [6]

7. (*a*) Explain indexing method for jigs and fixture. [6]

(*b*) State various types of locating devices used in jig and fixtures and explain 'V' locator in detail with neat sketch. [7]

Or

8. (*a*) Explain turning fixture. [3]

(*b*) Design and draw a drill jig to drill the four equispaced holes on the job shown in Fig. 8(b) [10]

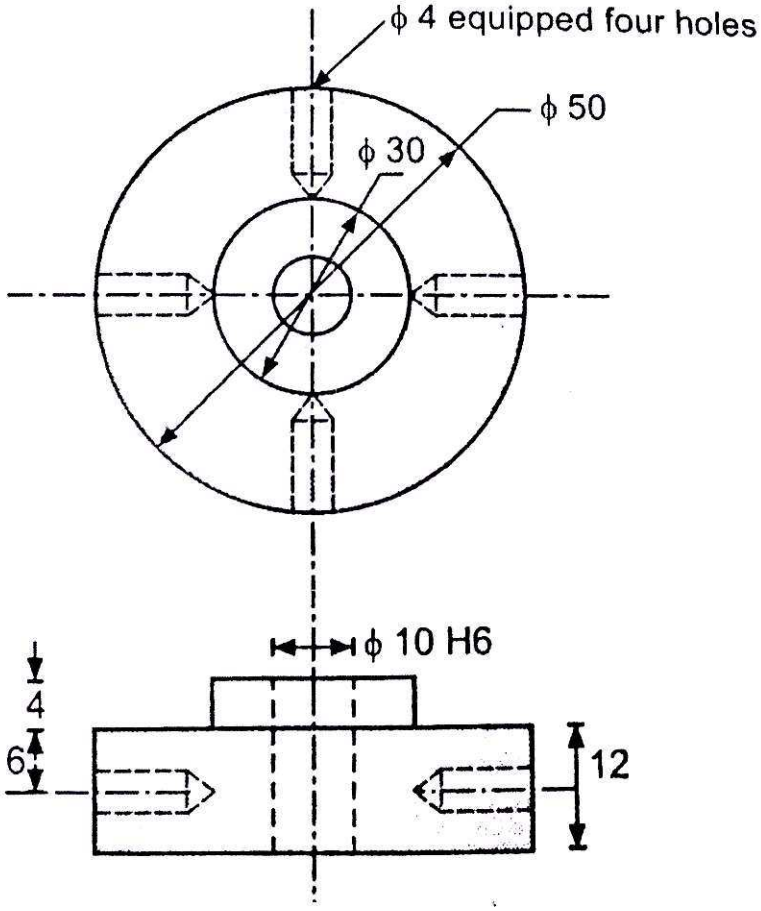


Fig. 8(b)

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+3**

Seat No.	

[4757]-103

S.E. (Civil) (First Semester) EXAMINATION, 2015

STRENGTH OF MATERIALS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of electronic pocket calculator is allowed.

(*iv*) Assume suitable data, if necessary.

(*v*) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 from Section I and Q. No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10, Q. No. 11 or Q. No. 12 from Section II.

(*vi*) Answers to the two sections should be written in separate answer books.

SECTION I

1. (*a*) A circular bar of 500 mm length has cross-sectional area as shown in Fig. 1. Determine the maximum axial pull 'P' for

P.T.O.

which the bar may be subjected if the maximum stress is limited to 100 MPa. Also find the total change in length. Diameter of (AB) = 12 mm, (BC) = 20 mm and (CD) = 30 mm. [5]

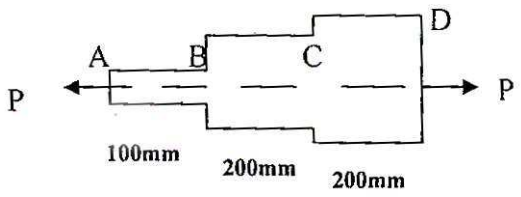


Fig. 1

(*b*) Calculate the support reactions of the bar at junction 'B' of the member loaded as shown in Fig. 2. Assume E = 200 MPa and diameter = 25 mm. [5]

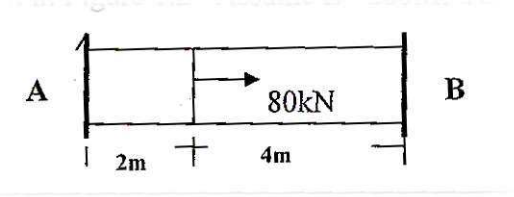


Fig. 2

(*c*) A steel bar 120 mm long, 40 mm × 40 mm in cross-section is subjected to tensile load 200 kN along longitudinal axis and tensile loads of 500 kN and 400 kN on lateral faces as shown

in Fig. 3. Change in volume was observed to be 100 mm^3. Find the value of Poisson's ratio and Bulk Modulus. Take E = 200 GPa. [6]

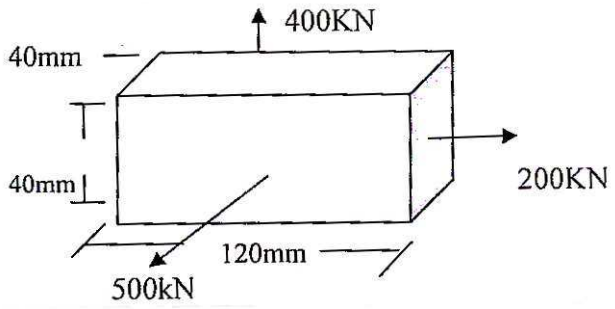


Fig. 3

Or

2. (*a*) A bar of steel is 50 mm × 100 mm in cross-section and is 1.4 m long. It is subjected to a tensile load of 250 kN along the longitudinal axis. Find the change in dimension of the bar and change in volume. [8]

(*b*) An axial compressive force 300 kN is applied to the assembly shown in Fig. 4 by means of rigid end plates. The diameter of Brass core is 20 mm and outside diameter of aluminium tube is 60 mm. Determine : [8]

(*i*) Normal stress in Aluminium Shell

(*ii*) Normal stress in the Brass Core

(*iii*) Corresponding deformation of the assembly.

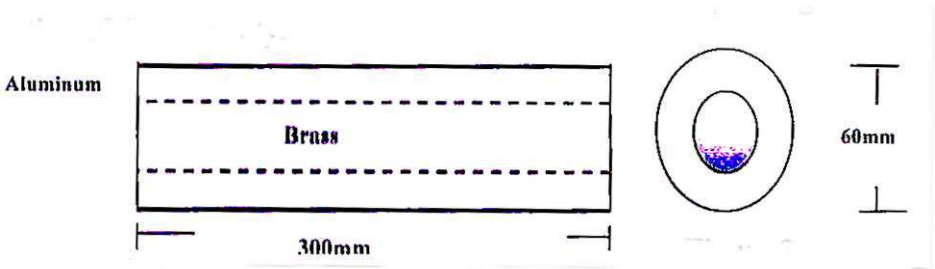


Fig. 4

3. (*a*) Draw shear force diagram and Bending Moment diagram for the beam as shown in Fig. 5. Indicate the numerical values at all important section. Find the position of contraflexure are, if any. [10]

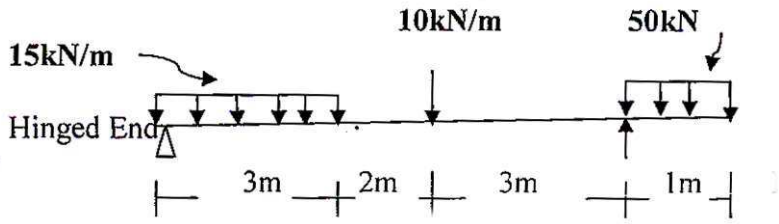


Fig. 5

(*b*) Derive relation between load intensity, shear force and bending moment at a section of a prismatic bar. Show that the bending moment is maximum at a section where shear force is zero. [8]

Or

4. (*a*) Draw SFD and BMD for the beam loaded as shown in Fig. 6. [9]

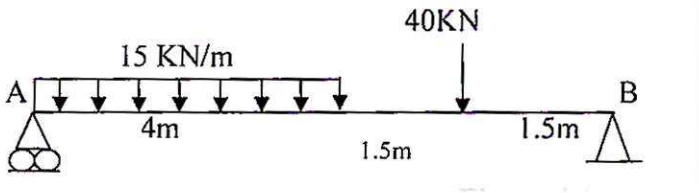


Fig. 6

(*b*) Draw the bending moment diagram and loading diagram from given shear force diagram if beam is subjected to a moment at a distance 2 m from end A. (Refer Fig. 7). [9]

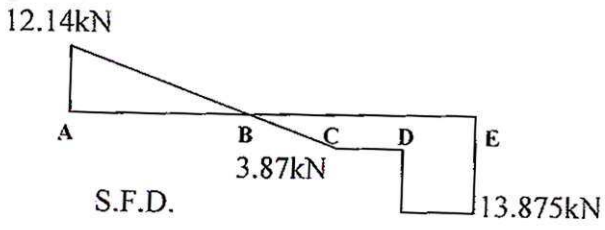


Fig. 7

5. (*a*) Show that the ratio of maximum to mean shear stress on rectangular cross-section of a beam is 1.5. [8]

(*b*) A timber beam 100 mm wide and 200 mm deep is strengthened by a steel plate 100 mm wide and 10 mm thick as shown in Fig. 8. Calculate the moment of resistance of the beam if the safe stress in timber and steel are 10 MPa and 150 MPa respectively. Take $E_{steel} = 20\ E_{Timber}$. [8]

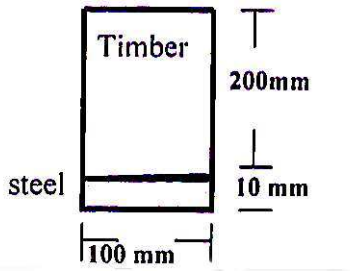


Fig. 8

Or

6. (*a*) Draw shear stress distribution diagram for cross-section of beam shown in Fig. 9. The shear force at section is 200 kN and M.I. is 1.134×10^8 mm^4. [8]

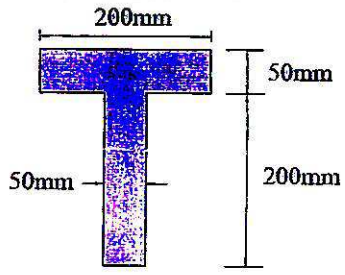


Fig. 9

(*b*) The cross-section of a simply supported beam of 6 m span is shown in Fig. 10. If permissible stresses are 100 MPa in compression and 40 MPa in tension. Find the safe UDL the beam can carry. [8]

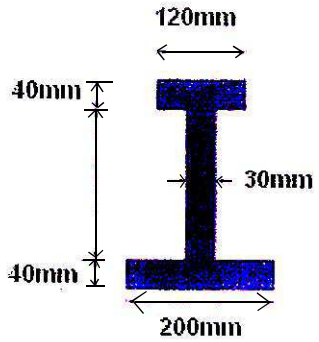


Fig. 10

SECTION II

7. (*a*) A load 600 N falls freely through a height of 160 mm onto a collar attached to the end of vertical rod of 50 mm diameter and 2.5 m long, the upper end being fixed to the ceiling. Calculate the maximum instantaneous extension of bar. Also calculate the maximum stress in the bar. Assume E = 200 GPa. [8]

(*b*) A composite shaft consists of a steel rod 100 mm in diameter surrounded by a closely fitting brass tube fixed to it. Find the outer diameter of the tube so that when a torque is applied to composite bar, it will be shared equally by both the materials. If the torque is 20 kN.m, calculate the maximum shear stress in each material and angle of twist in a length of 4 m. Take G_{st} = 80 GPa, G_{Br} = 40 GPa. [10]

Or

8. (*a*) Derive the expression for instantaneous stress induced in the rod due to fall of weight 'W' through a height '*h*'. The cross-sectional area of rod is 'A' and modulus of elasticity 'E'. [8]

(*b*) The Fig. 11 shows a horizontal shaft AD subjected to torque at 'B' and 'C'. Determine : [10]

(*i*) The diameter of the shaft if maximum shear stress is not to exceed 120 MPa.

(*ii*) The end fixing couples in magnitude and direction.

(*iii*) Plot twisting moment diagram.

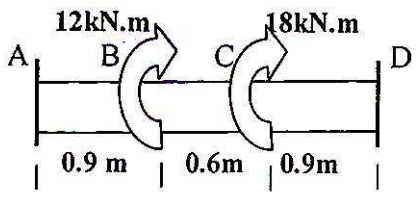


Fig. 11

9. (*a*) For the element shown in Fig. 12, locate the planes on which magnitude of the shear stress are equal. Show the results on properly oriented elements. Also find principal stress. [8]

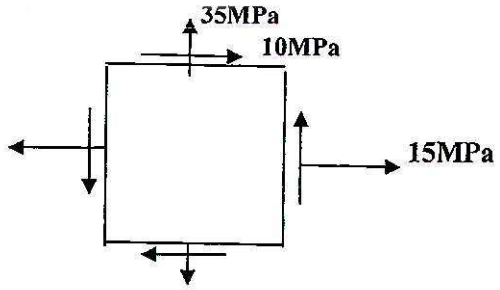


Fig. 12

(*b*) Derive the expression for principal stress and principal planes for a solid circular shaft of diameter 'D' subjected to combined torsion and bending effects. [8]

Or

10. (*a*) At a section in a strained material, the stresses on two mutually perpendicular planes are as shown in Fig. 13. Find stresses and maximum shear stress. [8]

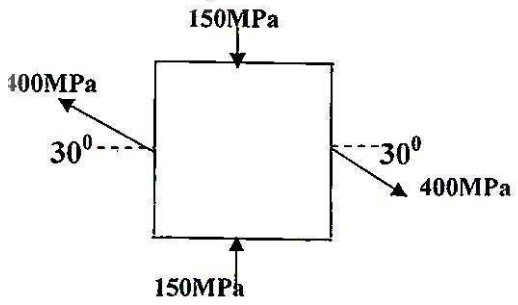


Fig. 13

(*b*) A shaft of hollow circular cross-section with outside diameter 200 mm and inside diameter 160 mm is subjected to a torque of 11.1 kN.m and axial compressive force of 362 kN. Determine the maximum tensile stress, maximum compressive stress and maximum shear stress in the shaft. [8]

11. (*a*) Explain the limitations of Euler's formula ? Define effective length of column. [8]

(*b*) A tapering chimney of hollow circular cross-section is 25 m high. Its external diameter at the base is 3 m and at the top 2 m. If the weight of the chimney is 1800 kN, find the uniform horizontal wind pressure that may act per unit projected area of the chimney in order to just avoid tension at the base. [8]

Or

12. (*a*) State the assumptions made in Euler's Theory. Derive the expression for the critical load for a column pinned at both ends. [8]

(*b*) The cross-section of a column is hollow rectangular section having external dimension 120 mm × 80 mm, internal dimensions 100 mm × 60 mm with uniform thickness 10 mm. It is 5 m long having one end fixed and other end hinged. Find safe load it can carry by : [8]

(*i*) Euler's formula

(*ii*) Rankine's formula.

Assume E = 200 GPa, σ_C = 320 MPa, α = 1/7500 and factor of safety = 3.

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-1030

S.E. (Mechanical Sandwich) (Second Semester)

EXAMINATION, 2015

THERMAL ENGINEERING

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Solve any *four* questions (Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**).

(*ii*) *All* the *four* questions should be solved in one answer-book and attach extra supplements if required.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of steam tables, Mollier charts, scientific calculator is allowed.

(*vi*) Assume suitable data, if necessary.

1. (*a*) A single acting, single stage reciprocating air compressor of 250 mm bore and 350 mm stroke runs at 200 rpm. The suction and

P.T.O.

delivery pressures are at 1 bar and 6 bar respectively. Calculate the theoretical power required to run the compressor under each of the following conditions of compression : [6]

(*i*) Isothermal

(*ii*) Polytropic n = 1.3, and

(*iii*) Isentropic, $\gamma = 1.4$

Neglecting the effect of clearance, show compression processes results on P-V diagram and write a comment on results.

(*b*) Write short notes on : [3+3]

(*i*) Use of p-h chart

(*ii*) Unit of refrigeration.

Or

2. (*a*) A refrigeration cycle uses Freon-12 as the working fluid. The temperature of the refrigerant in the evaporator is –10°C. The condensing temperature is 40°C. The cooling load is 150 W and the volumetric efficiency of the compressor is 80%. The speed of the compressor is 720 rpm. Show the processes on p-h chart and calculate : [6]

(*i*) The mass flow rate of the refrigerant

(*ii*) The displacement volume of the compressor.

Properties of Freon-12

Temperature (°C)	Saturation pressure (MPa)	Enthalpy (kJ/kg)		Specific volume (m^3/kg) Saturated vapour
		Liquid	Vapour	
–10	0.22	26.8	183.0	0.08
40	0.96	74.5	203.1	0.02

(*b*) Why are multistage compressors preferred over single stage ? Explain in detail with P-V diagram. [6]

3. (*a*) A room contains air at 25°C and 100 kPa at a relative humidity of 75%. Using psychrometry relations, determine : [6]

(*i*) the partial pressure of dry air

(*ii*) the specific humidity

(*iii*) the enthalpy per unit mass of the dry air

Given : C_p = 1.005 kJ/kg. K for air

(*b*) Explain battery ignition system with a neat sketch. [6]

Or

4. (*a*) Explain the following with psychrometric chart : [6]

(*a*) Heating and Humidification

(*b*) Cooling and Dehumidification.

(*b*) A 4-cylinder, 4-stroke petrol engine develops 21 kW. A morse test was conducted at constant speed of 3000 rpm and B.P is measured, when each cylinder was cut-off are 14.8, 14.5, 14.6 and 14.75 kW respectively. Find I.P. of the engine when all cylinders are developing power. Also find mechanical efficiency and break mean effective pressure Pbm. Take bore = 7.5 cm and stroke = 9 cm. [6]

5. (*a*) Describe with neat sketch construction and working of catalytic converter system. [6]

(*b*) Explain stages of combustion in C.I. Engine. [7]

Or

6. (*a*) Explain any *two* types of combustion chambers used in S.I. Engines. [6]

(*b*) Write short notes on : [3+4]

(*i*) Cetane number

(*ii*) Emissions from S.I. and C.I. engines

7. (*a*) State the difference between jet propulsion and rocket propulsion. [6]

(*b*) Derive optimum pressure ratio for maximum net work as function of the limiting temperature ratio and show that intermediate temperature must be equal to the geometric mean of temperature limits of the cycle. [5+2]

Or

8. (*a*) Explain the workings of a turbojet engine with the help of a sketch. What are its applications ? [6]

(*b*) In a gas turbine plant air is compressed from 1 bar and 15°C though a pressure ratio of 4 : 1. It is then heated to 650°C in combustion chamber and expanded to 1 bar pressure in a turbine. Calculate the cycle efficiency and work ratio if a perfect heat exchanger is used. Take ηc = 0.8 and ηt = 0.85. Show the arrangement of the components of the plant and represent the processes on T-S diagram. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-1031

S.E. (Electrical/Instru.) (First Semester)

EXAMINATION, 2015

ENGINEERING MATHEMATICS—III

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Attempt Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of non-programable electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Solve any *two* : [8]

(*i*) $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^{e^x}$

(*ii*) $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} + 4y = \cos(\log x) + x\sin(\log x)$

(*iii*) $(D^2 + 4)\ y = \sec 2x$ by variation of parameters method.

P.T.O.

(*b*) Find Laplace-transform of $\frac{1-\cos t}{t}$. [4]

Or

2. (*a*) The charge Q on the plate of condenser satisfies the equation : [4]

$$\frac{d^2Q}{dt^2} + \frac{Q}{LC} = \frac{E}{L}\sin\frac{t}{\sqrt{LC}}$$

Prove that the charge at any time t is given by

$$Q = \frac{EC}{2}\left[\sin \omega t - \omega t \cos \omega t\right]$$

where $\omega = \frac{1}{\sqrt{LC}}$ and Q = 0 at $t = 0$.

(*b*) Solve (any *one*) : [4]

(*i*) $L[t \cup(t - 4) - t^3 \delta(t - 2)]$

(*ii*) $L^{-1}\left[\frac{1}{s^2(s+1)^2}\right]$ by convolution theorem.

(*c*) Solve by Laplace-transform method : [4]

$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 5y = e^{-t}\sin t$$

with $y(0) = 0$ and $y'(0) = 1$.

3. (*a*) Find inverse Fourier sine transform of : [4]

$$F_s(\lambda) = \frac{1}{\lambda} e^{-a\lambda}, \ \lambda > 0 .$$

(*b*) Find inverse *z*-transform of : [4]

$$F(z) = \frac{z^2}{(z-1)\left(z-\frac{1}{2}\right)^2}, |z| > \frac{1}{2}.$$

(*c*) Find directional derivatives of

$$\phi = e^{2x-y-z}$$

at (1, 1, 1) in the direction of tangent to curve

$$x = e^{-t}, \ y = 2\sin t + 1, \ z = t - \cos t$$

at $t = 0$. [4]

Or

4. (*a*) Prove the following (any *one*) : [4]

(*i*) $\nabla \cdot \left[r \nabla \left(\frac{1}{r^4} \right) \right] = \frac{8}{r^5}$

(*ii*) $\nabla \cdot \left(\frac{\bar{a} \times \bar{r}}{r} \right) = 0 .$

(*b*) Show that vector field [4]

$$\bar{F} = \left(6xy + z^3\right) \bar{i} + \left(3x^2 - z\right) \bar{j} + \left(3xz^2 - y\right) \bar{k}$$

is irrotational. Find scalar function ϕ such that :

$$\bar{F} = \nabla\phi .$$

(*c*) Solve the difference equation : [4]

$$f(k + 2) + 3 f(k + 1) + 2 f(k) = 0,$$

$$f(0) = 0, \; f(1) = 1.$$

5. (*a*) Evaluate :

$$\int_C \bar{F} \cdot d\bar{r}$$

where

$$\bar{F} = zi + xj + yk$$

and C is the arc of the curve $x = \cos t$, $y = \sin t$, $z = t$ from $t = 0$ to $t = 2\pi$. [4]

(*b*) Evaluate :

$$\iint_S \nabla \times \bar{F} \cdot d\bar{s}$$

for vector field

$$\bar{F} = 4yi - 4xj + 3k$$

where s is a disc of radius 1 lying on the plane $z = 1$ and C is its boundary. [4]

(*c*) Evaluate :

$$\iint_S \left(x^3 \ dydz + x^2 y \ dzdx + x^2 z \ dxdy \right)$$

where S is the closed surface consisting of the circular cylinder

$$x^2 + y^2 = a^2,$$

$z = 0$ and $z = b$. [5]

Or

6. (*a*) Using Green's theorem, evaluate

$$\int_C \left(\frac{1}{y} dx + \frac{1}{x} dy \right)$$

where C is the boundary of the region bounded by the parabola $y = \sqrt{x}$ and the lines $x = 1$, $x = 4$. [4]

(*b*) Evaluate :

$$\iint_S \bar{F} \ . \ d\bar{s}$$

using Gauss divergence theorem where

$$\bar{F} = 2xyi + yz^2 j + xzk$$

and s is the region bounded by

$x = 0$, $y = 0$, $z = 0$, $y = 3$, $x + 2z = 6$. [5]

(*c*) Evaluate :

$$\int_C \bar{F} \cdot d\bar{r}$$

by Stokes' theorem, where

$$\bar{F} = y^2 i + x^2 j - (x + z)k$$

and C is the boundary of the triangle with vertices at (0, 0, 0), (1, 0, 0) and (1, 1, 0). [4]

7. (*a*) If $\phi + i\psi$ is complex potential for an electric field and

$$\phi = -2xy + \frac{x}{x^2 + y^2},$$

find function ψ. [4]

(*b*) Evaluate :

$$\oint_C \frac{z + 4}{(z+1)^2 (z+2)^2} dz$$

where 'C' is a circle $|z + 1| = \frac{1}{2}$. [5]

(*c*) Find the bilinear transformation which maps points 1, 0, i of z-plane onto the points ∞, –2, $-\frac{1}{2}(1 + i)$ of w-plane. [4]

Or

8. (*a*) Show that analytic function with constant amplitude is constant. [4]

(*b*) Evaluate :

$$\int_{2+4i}^{5-5i} (z+1)\, dz$$

along the line joining the points $2 + 4i$ and $5 - 5i$. [5]

(*c*) Find the image of Hyperbola :

$$x^2 - y^2 = 1$$

under the transformation $w = \frac{1}{z}$. [4]

Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[4757]-1032

S.E. (Electrical) (I Sem.) EXAMINATION, 2015

POWER GENERATION TECHNOLOGIES

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) *All* questions are compulsory.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

1. (*a*) What is the function of draught system in thermal power plant ? With a neat diagram explain its working. [6]

(*b*) Compare nuclear, diesel and gas turbine power plants. [6]

Or

2. (*a*) With the help of diagram explain the main parts and working of thermal power plant. [6]

(*b*) Explain the nuclear reactor in nuclear power plant. [6]

3. (*a*) Differentiate between the working of Francis turbine and Kaplan turbine used in hydropower plants. [6]

(*b*) Describe the types of wind turbine electrical generators. [7]

P.T.O.

Or

4. (*a*) In hydro-power plants, write short notes on : [6]

(*i*) Dams

(*ii*) Penstocks.

(*b*) Explain how the wind pattern affects power generation in wind energy systems. [7]

5. (*a*) What are solar energy collectors ? Write their types and compare them. [7]

(*b*) Explain stand-alone, hybrid stand-alone and grid connected renewable energy systems. [6]

Or

6. (*a*) Explain the impacts of temperature and insolation on I-V curves of PV cells. [6]

(*b*) Describe the fuel cells. How are they used for energy storage requirements ? [7]

7. (*a*) Explain a generic photo-voltaic cell. [3]

(*b*) Define the terms in solar energy system : [3]

(*i*) Solar constant

(*ii*) Cloudy index

(*iii*) Concentration ratio.

(*c*) Explain the process of municipal solid waste to energy conversion. [6]

Or

8. (*a*) Explain the methods of measurement of solar radiation. [6]

(*b*) Write a short note on 'Small-mini-micro hydro-plant'. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1033

S.E. (Electrical) (I Sem.) EXAMINATION, 2015

MATERIAL SCIENCE

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Figures to the right indicate full marks.

Physical Constants :

(1) Angstrom Unit (AU) = 1×10^{-10} metres

(2) Boltzmann's Constant (k) = 1.380×10^{-23} joule.degree^{-1}

(3) Charge on Electron (e) = 1.601×10^{-19} coulomb

(4) Mass of Electron (m) = 9.107×10^{-31} kg

(5) Electron volt (eV) = 1.602×10^{-19} joules

(6) Mass of Proton (m_p) = 1.627×10^{-27} kg

(7) Velocity of light (c) = 2.998×10^{8} m/sec

(8) Dieletric Constant of free space (ε_0) = 8.854×10^{-12} F/m

(9) Permeability of free space (μ_0) = $4\pi \times 10^{-7}$ H/m

(10) Debye Unit = 3.33×10^{-30} coulomb.metre

1. (*a*) Define dielectric loss tangent and explain it with phasor diagram. [6]

(*b*) Write down insulating materials used for insulators and switch gears. [6]

P.T.O.

Or

2. (*a*) Write down the materials used for various photoconductive cells. [6]

(*b*) Describe various crystal defects. [6]

3. (*a*) Describe magnetic strip technology. [7]

(*b*) Differentiate between characteristics of high and low resistive materials. [6]

Or

4. (*a*) In a material an application of magnetic field of 2.75×10^3 kA/m causes and magnetic flux density of 0.2485 Wb/m^2. Calculate its permeability, susceptibility and magnetization. [7]

(*b*) Write down properties and applications of :

(*i*) Silver and Silver alloys

(*ii*) Copper and Copper alloys. [6]

5. Write short notes on the following : [12]

(*i*) Carbon Nano-tubes (CNT)

(*ii*) Carbon clusters.

Or

6. Write short notes on the following : [12]

(*i*) Molecular Machines

(*ii*) Single Electron Transistor (SET).

7. (*a*) With neat sketch, explain how flux density is measured with the help of Gauss meter. [7]

(*b*) Describe the method for measurement of dielectric strength of resins and polymers. [6]

Or

8. (*a*) Explain the step by step method of finding dielectric strength of transformer oil with a neat diagram as per IS 6798. [7]

(*b*) Explain various tests carried out on high voltage cables. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1034

S.E. (Electrical) (I Sem.) EXAMINATION, 2015

ANALOG AND DIGITAL ELECTRONICS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Figures to the right indicate full marks.

1. (*a*) Using Boolean algebra simplify : [6]

(*i*) $ABC + A\bar{B}C + AB\bar{C}$

(*ii*) $\bar{A}B\bar{C}D + \bar{A}BCD + ABD$.

(*b*) Explain the operation of clocked SR flip-flop with truth table in detail. [6]

Or

2. (*a*) (*i*) Perform $(-4)_{10} - (-6)_{10}$ using the 2's complement form.

(*ii*) Perform $(-4)_{10} - (-8)_{10}$ using 1's complement form. [6]

(*b*) Draw the diagram, timing diagram and write the truth table for twisted ring counter. [6]

P.T.O.

3. (*a*) Draw the block diagram of OPAMP 741. For an ideal OPAMP give the values of the following parameter : [7]

(*i*) CMRR

(*ii*) Slew rate

(*iii*) Bandwidth

(*iv*) PSRR

(*v*) Offset voltage

(*vi*) Output impedance.

(*b*) Draw the diagram IC 555 configured in astable mode. Draw necessary waveforms. Give the formula for T_{on} and T_{off}. [6]

Or

4. (*a*) Explain the application of OPAMP as comparator. Show how the same circuit can be used as ZCD. [6]

(*b*) Explain first order low pass filter with neat circuit diagram and frequency response. [7]

5. (*a*) Draw transformer coupled amplifier and write its advantages, disadvantages and applications. [6]

(*b*) Explain DC load line analysis of CE configuration amplifier. [6]

Or

6. (*a*) Explain the drain characteristics of FET. [6]

(*b*) Explain Push Pull amplifier. [6]

7. (*a*) What is the need of filter circuit ? Explain LC filters. [6]

(*b*) List the performance parameters of 1-phase bridge rectifier supplying RL load. [7]

Or

8. (*a*) With the help of circuit diagram and relevant waveforms, explain the operation of a 3-phase bridge rectifier with resistive load. [7]

(*b*) Draw the circuit diagram and state the expression of the following for a 1-phase half-wave rectifier : [6]

(*i*) Average output voltage

(*ii*) RMS output voltage

(*iii*) Form factor

(*iv*) Ripple factor.

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1035

S.E. (Electrical) (First Semester) EXAMINATION, 2015
ELECTRICAL MEASUREMENT AND INSTRUMENTATION
(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Assume suitable data if necessary.

(*iv*) *All* questions are compulsory.

1. (*a*) Explain the following terms : [6]

(*i*) Accuracy

(*ii*) Repeatability

(*iii*) Reproducibility.

(*b*) Draw circuit diagram of Maxwell's Inductance capacitance bridge. Derive expression for unknown inductance with usual notations. [6]

Or

2. (*a*) Explain advantages and disadvantages of PMMC instrument. [6]

(*b*) Derive general equation for bridge at balance condition. [6]

P.T.O.

3. (*a*) Explain construction and working of Dynamometer type wattmeter. [6]

(*b*) A 230 V, 1 ϕ Energy meter has a constant of 4A passing through it for 6 hours at unity power factor. If the meter disc makes 2208 revolutions during this period what is the meter constant in revolution per kWh. Calculate the power factor of the load if the number of revolution's made by the meter are 1472 when operating at 230 V, 5A for 4 hours. [6]

Or

4. (*a*) A wattmeter has current coil of 0.1 Ω resistance and pressure coil of 6500 Ω resistance. Calculate the percentage error due to resistance only with each of the two method of connection. When reading the input to an apparatus which takes :

(*i*) 12 A at 250 V with unity power factor and

(*ii*) 12 A at 250 V with 0.4 power factor. [6]

(*b*) Explain electronic energy meter with neat block diagram. [6]

5. (*a*) Describe how the following measurements can be made with the use of CRO : [6]

(*i*) Voltage measurement

(*ii*) Current measurement

(*iii*) Time period.

(*b*) Describe capacitive pressure transducer with neat diagram. [7]

Or

6. (*a*) Waveform shown in figure is observed on a CRT screen. If the time/div switch is set to 10 μS and volt/div switch is set to 200 mV. Determine the frequency and peak to peak amplitude of the signal. [6]

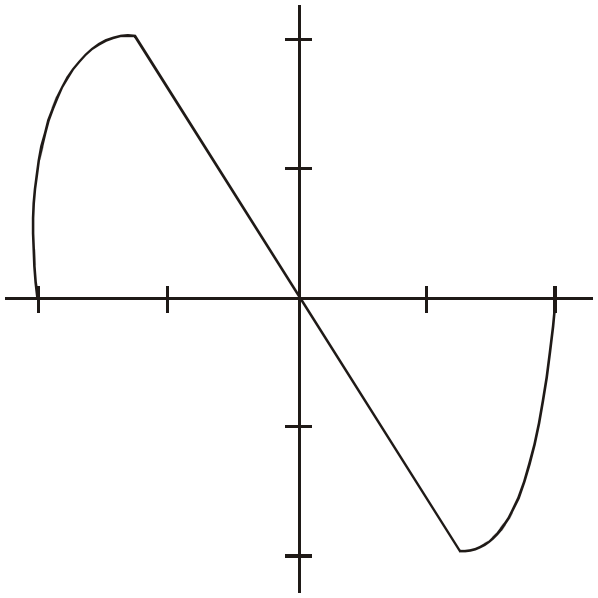


Fig.

(*b*) Explain basic requirements of transducer. [7]

7. (*a*) State types of strain gauges. Explain semiconductor strain gauge. [6]

(*b*) Explain inductive method of level measurement. [7]

Or

8. (*a*) Explain Ultrasonic method of level measurement. [6]

(*b*) Explain construction and working of LVDT with neat diagram. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1036

S.E. (Electrical) (Second Semester) EXAMINATION, 2015
POWER SYSTEM—I
(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8.**

(*ii*) Figures to the right indicate full marks.

(*iii*) Assume suitable data if necessary and state the same clearly.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Use of electronic pocket calculator is allowed.

1. (*a*) What is meant by tariff ? What are the objectives of tariff ? [6]

(*b*) Discuss the necessity of excitation systems for alternaters. Explain any *one* type of excitation system used for alternator in brief. [6]

Or

2. (*a*) An yearly load duration curve of a gas turbine power plant is straight line from 48,000 kW to 5000 kW. The load is taken by power plant which consists of two units of 20,000 kW each and one unit of 10,000 kW. Determine : [6]

(1) Load factor

(2) Capacity factor of plant.

P.T.O.

(*b*) Name the different types of insulators used in power system ? Explain the applications of each type of insulators. [6]

3. (*a*) Derive the expression for sag for unequal supports ? What is the effect of ice and wind loading ? [8]

(*b*) In a three-phase transmission line, three conductors are spaced at equal distance from each other i.e. 2.5 m. The diameter of each conductor is 1.3 cm. Find inductance per kilometer length of line. [5]

Or

4. (*a*) Derive the expression for internal and external flux linkages of conductor carrying current 'I' ampere and derive expression for inductance of single-phase line. [7]

(*b*) Give the classification of underground cables. [6]

5. (*a*) Derive an expression for line to neutral capacitance of three-phase overhead transmission line with unsymmetrical spacing of conductors. Assume complete transposition. [8]

(*b*) A single-phase transmission line has two parallel conductors 3.5 m apart from each other. The radius of each conductor is 1.5 cm. Calculate capacitance of line per kilometer. Assume $\varepsilon_r = 1$. [4]

Or

6. (*a*) Derive the equation for capacitance per kilometer of a single phase overheads transmission line having distance 'D' between conductors and '*r*' is radius of each conductors. [6]

(*b*) Explain the methods of images in determining the effect of earth on capacitance calculation for overhead transmission lines. [6]

7. (*a*) Determine generalized circuit constants of short transmission line. State its characteristics. [6]

(*b*) A medium single-phase transmission line 100 kg long has the following constants : [7]

R/km = 0.25 Ω

Reactance 1 km = 0.8 Ω

Susceptance 1 km = 14×10^{-6} (siemens)

Receiving end voltage = 66,000 V

Assume that total capacitance of line is located at receiving end alone. Determine :

(1) Sending end current

(2) Sending end voltage

(3) Regulation

(4) Supply power factor.

The line is delivering 15,000 kW at 0.8 p.f. (lagg).

Or

8. (*a*) Express the relationship for sending end voltage and current in terms of receiving end voltage and current for medium length transmission line with nominal 'T' method of representation. Draw neat circuit diagram and phasor diagram. [7]

(*b*) A three-phase transmission line, 132 kV is connected to a 50 MW load at p.f. of 0.85 (lagg). The line constants of 80 km long line are $z = 96 \angle 78\ \Omega$ and $Y = 0.001 \angle 90$ (S) Using nominal 'T' circuit representation Calcualte. A, B, C and D constants of transmission line. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1037

S.E. (Electrical) (Second Semester) EXAMINATION, 2015

ELECTRICAL MACHINES-I

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer *four* questions.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) With neat circuit diagrams, explain open circuit and short circuit tests on a single phase transformer for finding the voltage regulation and efficiency. [6]

(*b*) With neat circuit diagram, explain the V-V connection of transformers. State its merits and demerits. [6]

P.T.O.

Or

2. (*a*) Compare the two winding transformer with autotransformer. [3]

(*b*) Comment on various losses taking place in transformer. [3]

(*c*) With neat circuit diagram, explain the Scott connection of transformers to convert 3 phase supply into 2 phase supply. [6]

3. (*a*) Derive torque equation and speed equation in case of D.C. motor. [6]

(*b*) Explain the commutation process and its types in detail. [7]

Or

4. (*a*) Explain the role of commutator in D.C. motor along with the diagram. [7]

(*b*) Explain any *two* methods of speed control of d.c. shunt motor. [6]

5. (*a*) Explain the production of rotating mmf by 3-phase balanced voltage fed to a symmetrical 3-phase winding. [6]

(*b*) Explain power flow stages in case of three phase induction motor along with the diagram. [6]

Or

6. (*a*) A 14.71 kW, 4 pole, 50 Hz, 3-phase induction motor has friction and windage losses of 2% of the output power. The full load slip is 4%. Calculate rotor copper loss and output torque. [6]

(*b*) Derive the condition for maximum starting torque in case of induction motor. [6]

7. (*a*) Draw the circuit diagram for conducting (*i*) No load test and (*ii*) Blocked rotor test on three phase induction motor. How are its equivalent circuit parameters computed using these tests ? [8]

(*b*) Enlist various types of starters for three phase induction motor. With neat sketch, explain stator resistance starter along with its merits and demerits. [5]

Or

8. (*a*) Write step by step procedure to draw circle diagram from No Load test and blocked rotor test on three phase induction motor. [7]

(*b*) Write a short note on soft starter for 3-ph induction motor. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-1038

S.E. (Electrical Engineering) (Second Semester) EXAMINATION, 2015

NETWORK ANALYSIS

(2012 PATTERN)

Time : Three Hours **Maximum Marks : 50**

N.B. :— (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data if necessary.

1. (*a*) Simplify the circuit shown in Fig (1) and. Find V_1 : [6]

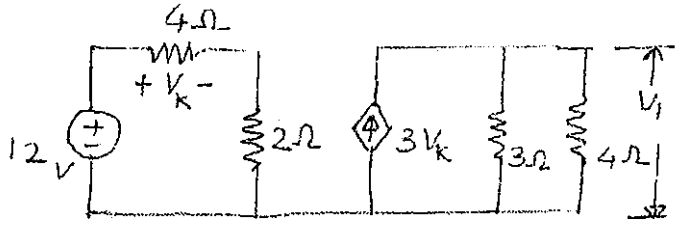


Fig (1)

P.T.O.

(*b*) Draw the dotted diagram and Find equivalent reactance as shown in Fig. (2) : [7]

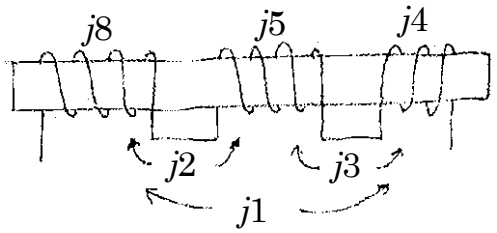


Fig. (2)

Or

2. (*a*) Find current through 5 Ω using Norton's theorem as shown in Fig. (3) : [7]

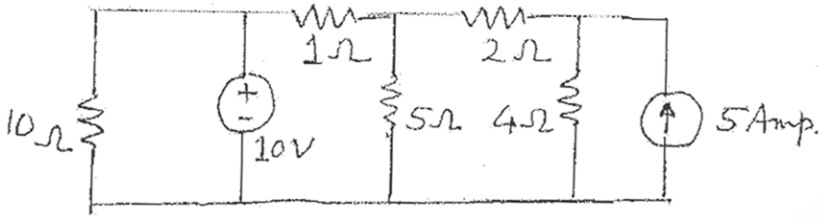


Fig (3)

(*b*) Find current through 15 Ω by using Millman's theorem. [6]

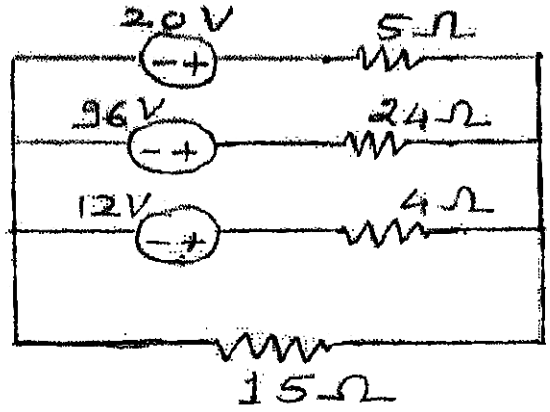


Fig. (4)

3. (*a*) For the circuit shown in Fig. (5), find $i(t)$ using classical theory. [7]

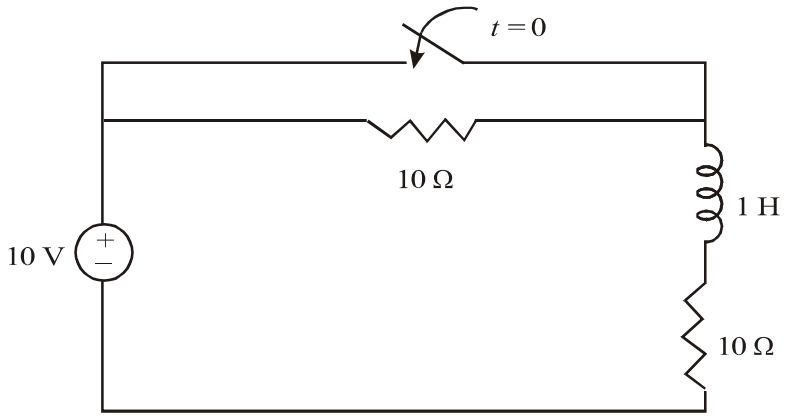


Fig. (5)

(*b*) Find current $i(t)$ by using Laplace transform. The switch is closed at time $t = 0$. [6]

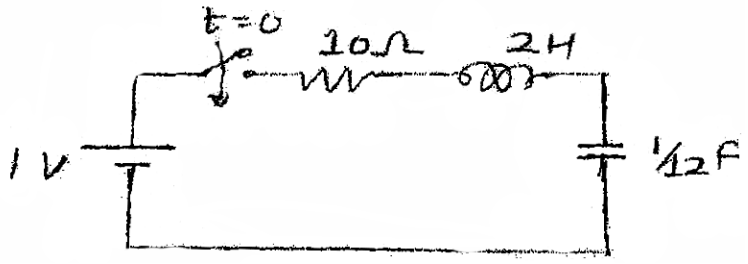


Fig. (6)

Or

4. (*a*) In the circuit shown in Fig. (7), the switch is moved to position 2 at time $t = 0$, find the expression of current for time $t > 0$ using Laplace transform : [7]

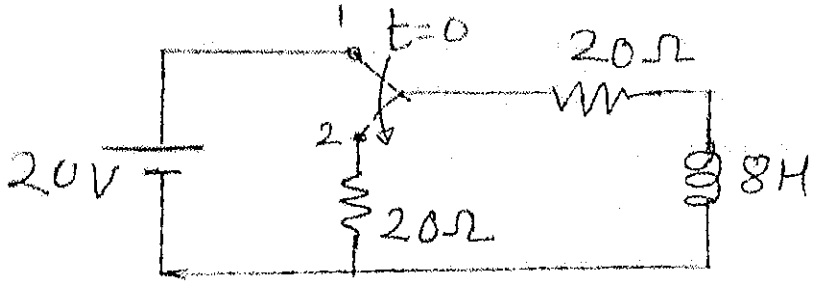


Fig. (7)

(*b*) Find $i(t)$, by using convolution integral : [6]

$$F(s) = \frac{1}{s^2 + 9s + 18}$$

5. (*a*) For the circuit as shown in Fig. (8), find transmission parameters : [6]

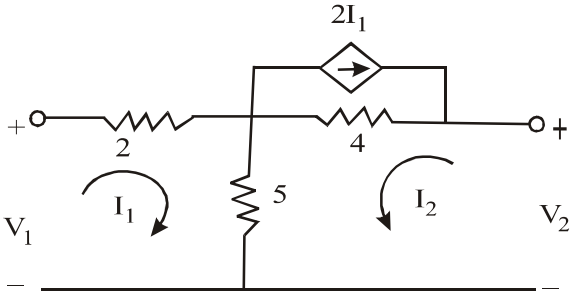


Fig. (8)

(*b*) For the network shown in Fig. (9) find hybrid parameters : [6]

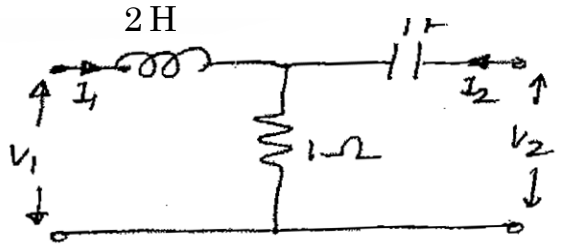


Fig. (9)

Or

6. (*a*) In the circuit shown in Fig. (10) find transmission parameters :[6]

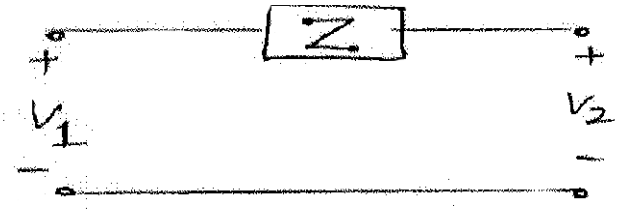


Fig. (10)

(*b*) Develop the relationship between transmission parameter and hybrid parameters. [6]

7. (*a*) For the network shown in Fig. (11), find the voltage transfer function : [6]

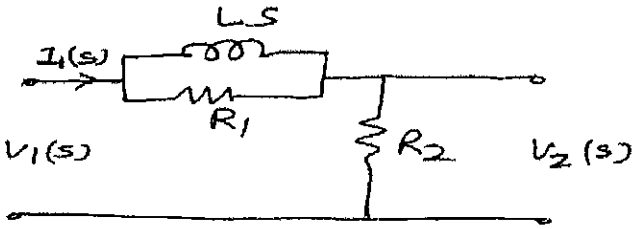


Fig. (11)

(*b*) Develop the relation of anti-resonant frequency in parallel resonance circuit, also develop the relation of impedance offered by parallel resonant circuit. [6]

Or

8. (*a*) Find driving point impedance of given network : [6]

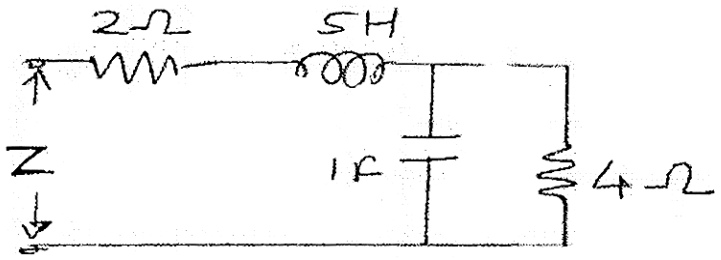


Fig. (12)

(*b*) A high pass filter is constructed from two capacitors 1 micro farad each and 15 millihenry inductance, find design resistance and cut-off frequency. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1039

S.E. (Electrical) (Second Semester) EXAMINATION, 2015

NUMERICAL METHODS AND COMPUTER PROGRAMMING

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. **1** *or* Q. **2**, Q. **3** *or* Q. **4**, Q. **5** *or* Q. **6**, Q. **7** *or* Q. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Give the syntax of 'for loop', 'while loop' and 'do-while loop' in C language. [6]

(*b*) State Descartes' Rule of sign and apply it to : [7]

$$x^4 + 2x^3 + 10x - 20 = 0.$$

P.T.O.

Or

2. (*a*) What are different data types in 'C' language ? Give their ranges. [6]

(*b*) Explain Birge Vieta method to find the root of polynomial equations. [7]

3. (*a*) Explain Newton-Raphson method to find the root of equation with its pitfalls. [6]

(*b*) Use Lagrange's interpolation to find polynomial equation to fit the following data points : [6]

(0, 2), (1, 3), (2, 12) and (5, 147)

Hence find $y(3)$.

Or

4. (*a*) Derive formula of Newton's Backward interpolation for equally spaced data points. [6]

(*b*) Find the root of $x^2 - 49 = 0$ using bisection method at the end of sixth iteration in interval [5, 8]. [6]

5. (*a*) Explain Gauss-Jordan method to solve the system of linear simultaneous equations. [6]

(*b*) Solve the following system of equations using Gauss Elimination method : [6]

$$\begin{bmatrix} 8 & -4 & 0 \\ -4 & 8 & -4 \\ 0 & -4 & 8 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ 0 \\ 4 \end{bmatrix}.$$

Or

6. (*a*) Explain Gauss-Jacobi method to solve the system of linear simultaneous equations. [6]

(*b*) Solve the following system of equations using Gauss-Seidel method. Initial values $[0,\ 0,\ 0]^{T}$. Show 3 iterations : [6]

$$\begin{bmatrix} 8 & -4 & 0 \\ -4 & 8 & -4 \\ 0 & -4 & 8 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ 0 \\ 4 \end{bmatrix}.$$

7. (*a*) Explain Modified Euler's method to solve ordinary differential equations. [6]

(*b*) Solve : [7]

$$\int_{1}^{2} \int_{1}^{2} (x^2 + y^2)\, dx\, dy$$

using Trapezoidal rule. Take $h = k = ½$.

Or

8. (*a*) Derive formula for Simpson's (3/8)th rule using Newton-Cote's formula for numerical integration. [6]

(*b*) Solve :

$$\frac{dy}{dx} = x + y$$

for $x = 0.2, 0.4$ by using Taylor series method. Given $x_0 = 0$, $y_0 = 1$, $h = 0.2$. [7]

Total No. of Questions—**6**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-104

S.E. (Civil) (I Sem.) EXAMINATION, 2015

ENGINEERING GEOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

SECTION I

1. Explain with suitable examples Textures of Igneous Rocks due to their mode of origin. [16]

Or

(*a*) Describe parallel Textures of Metamorphic rocks. [8]

(*b*) What is weathering ? Describe types of weathering. [8]

2. (*a*) Describe physiographic divisions of India. Write a note on changes of climate during Gondwana period. [8]

(*b*) What is Rejuvenation ? Explain any *two* features resulting from the rejuvenation. [8]

P.T.O.

Or

(*a*) State and explain general principles of stratigraphy. [8]

(*b*) Describe with neat sketches Landforms resulted due to erosion by River. [8]

3. (*a*) What are the Faults ? Describe different types with neat sketches. [10]

(*b*) Write a note on Concordant Igneous Intrusions. [8]

Or

(*a*) Write a note on Batholyths and Dykes. [9]

(*b*) Describe Orogenesis and Epeirogenesis. [9]

SECTION II

4. (*a*) Describe in detail subsurface Geological Exploration. [10]

(*b*) Write a note on Remote sensing in Civil Engineering. [6]

Or

(*a*) What observations and precautions are necessary during drilling ? [8]

(*b*) Describe in detail Geological activity of Groundwater. [8]

5. (*a*) What are the Earthquakes ? How are they caused ? Explain P-waves and S-waves. [10]

(*b*) Write a note on confined aquifers and Perched aquifers. [6]

Or

(*a*) What are the Landslides ? Discuss preventive measures. [10]

(*b*) Write a note on Indian Building stones. [6]

6. (*a*) What problems may have to be faced while tunneling in Tectonic areas ? [10]

(*b*) Discuss the problems that can occur due to presence of fault along dam alignment and treatment to be given. [8]

Or

(*a*) Discuss in detail Tunneling conditions in Deccan Trap Basalts and associated features. [13]

(*b*) Write a note on Geological conditions suitable for Reservoir site. [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1040

S.E. (Electrical) (Second Semester) EXAMINATION, 2015

FUNDAMENTALS OF MICROPROCESSOR AND MICROCONTROLLER

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Explain the function of pins of 8085 : [4]

(*i*) HOLD

(*ii*) INTR

(*b*) Explain the stack and stack pointer in 8085 microprocessor. [4]

(*c*) Draw the timing diagram of I/O Read Machine Cycle. [4]

P.T.O.

Or

2. (*a*) State the condition of each flag after execution of instruction in 8085 microprocessor : [4]

(*i*) XRI 05H

(*ii*) MVJ A, 05H

(*b*) Write down assembly language program for 8085 microprocessor to add two 8-bit numbers stored in memory location 4050 H and 4051 H. Store the result in 5000 H and 5001 H memory location. [4]

(*c*) Write down any *four* features of Intel 8085. [4]

3. (*a*) List the operating modes of 8255. Draw control word format of I/O mode and BSR mode. [6]

(*b*) Draw PSW and explain various Flags in 8051 microcontroller. [7]

Or

4. (*a*) Write an assembly language program to generate triangular waveform using DAC interfaced with 8051 microcontroller. [7]

(*b*) Draw the format of TMOD and TCON registers. [6]

5. (*a*) List down the various addressing modes used in instruction set of 8051. Give *one* example of each. [6]

(*b*) Explain steps to transfer data serially in 8051 and importance of TI flag. [6]

Or

6. (*a*) Explain the following instructions : [6]

(*i*) SWAP A

(*ii*) DJNZ R0, Label

(*iii*) PUSH 00H

(*b*) What will be the contents of the accumulator and register R0 after execution of the following code : [6]

```
MOV A, # 88 H

ADD A, # 06H

MOV R0, A

DA A

HERE : SJMP HERE
```

7. (*a*) Explain energy measurement using 8085 with suitable block diagram. [6]

(*b*) Draw and explain stepper motor control using 8051. [7]

Or

8. (*a*) Explain power factor measurement using 8085 with block diagram. [6]

(*b*) Explain with interfacing diagram, temperature measurement using 8051. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-1041

S.E. (Electronics/E & TC) (Second Semester)

EXAMINATION, 2015

ENGINEERING MATHEMATICS-III

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** and Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Solve any *two* : [8]

(*i*) $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = e^{-2x}\sin 2x$

P.T.O.

(*ii*) $(D^2 - 4D + 4)y = e^{2x}x^{-2}$ (by variation of parameters)

(*iii*) $x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} + 2y = x + \frac{1}{x}$

(*b*) Solve : [4]

$$f(k) - 4f(k - 2) = \left(\frac{1}{2}\right)^k, \; k \geq 0$$

Or

2. (*a*) The charge Q on the plate of condencer satisfies the differential equation : [4]

$$\frac{d^2Q}{dt^2} + \frac{Q}{LC} = \frac{E}{L} \sin \frac{t}{\sqrt{LC}}$$

Assuming $\frac{1}{LC} = \omega^2$ find the charge Q at any time '*t*'.

(*b*) Find the Fourier sine integral representation for the function : [4]

$$f(x) = \begin{cases} \frac{\pi}{2} \; ; \; 0 < x < \pi \\ 0 \; ; \; x > \pi \end{cases}$$

(*c*) Attempt any *one* : [4]

(*i*) Find *z*-transform of $f(k) = ke^{-3k}; \; k \geq 0$

(*ii*) Find :

$$z^{-1}\left[\frac{z^2}{z^2 + 1}\right]$$

3. (*a*) Given :

$$\frac{dy}{dx} = 3x + \frac{y}{2};\ y(0) = 1 \quad h = 0.1$$

Evaluate $y(0.1)$ by using Runge-Kutta method of fourth order. [4]

(*b*) The distance travelled by a point p in XY – plane in a mechanism is given by y in the following table. Estimate distance travelled by p when $x = 4.5$.

x	***y***
1	14
2	30
3	62
4	116
5	198

[4]

(*c*) Find the directional derivative of function $\phi = xy^2 + yz^3$ at (1, −1, 1) along the direction normal to the surface $2x^2 + y^2 + 2z^2 = 9$ at (1, 2, 1). [4]

Or

4. (*a*) Prove that (any *one*) : [4]

(*i*) $\bar{a} \cdot \nabla\left[\bar{b} \cdot \nabla \frac{1}{r}\right] = -\frac{(\bar{a} \cdot \bar{b})}{r^3} + \frac{3(\bar{b} \cdot \bar{r})(\bar{a} \cdot \bar{r})}{r^5}$

(*ii*) $\nabla \cdot \left[r \nabla \frac{1}{r^5}\right] = \frac{15}{r^6}$.

(*b*) Use Trapezoidal Rule to estimate the value of :

$$\int_0^2 \frac{x}{\sqrt{2 + x^2}}\, dx$$

by taking $h = 0.5$. [4]

(*c*) Show that the vector field $f(r)\bar{r}$ is always irrotational and then determine F(*r*) such that vector field $f(r)\bar{r}$ is solenoidal. [4]

5. (*a*) Evaluate :

$$\int_C \left[(2x^2y + y + z^2)i + 2(1 + yz^3)j + (2z + 3y^2z^2)k\right] . d\bar{r}$$

along the curve C : $y^2 + z^2 = a^2$ $x = 0$ [4]

(*b*) Find

$$\iint_S \bar{F} \cdot \hat{n}\, ds .$$

where s is the sphere $x^2 + y^2 + z^2 = 9$ and

$$\bar{F} = \left(4x + 3yz^2\right)\hat{i} - \left(x^2z^2 + y\right)\hat{j} + \left(y^3 + 2z\right)\hat{k}$$ [4]

(*c*) Evaluate :

$$\iint_S \nabla \times \bar{F} \cdot \hat{n}\, ds$$

for the surface of the paraboloid $z = 4 - x^2 - y^2$; $(z \geq 0)$ and

$\bar{F} = y^2\hat{i} + z\hat{j} + xy\hat{k}$. [5]

Or

6. (*a*) Find the total work done in moving a particle is a force field $\bar{F} = 3xy\hat{i} - 5z\hat{j} + 10x\hat{k}$ along the curve $x = t^2 + 1$, $y = 2t^2$, $z = t^3$ from $t = 1$ and $t = 2$. [5]

(*b*) Using divergence theorem to evaluate the surface integral $\iint_S \bar{F} \cdot \hat{n}\, ds$ where $\bar{F} = \sin x\, i + \left(2 - \cos x\right) j$ and S is the total surface area of the parallelopiped bounded by $x = 0$, $x = 3$, $y = 0$, $y = 2$, $z = 0$ and $z = 1$. [4]

(*c*) Equations of electromagnetic wave theory are given by :

(*i*) $\nabla . \bar{D} = \rho$

(*ii*) $\nabla . \bar{H} = 0$

(*iii*) $\nabla \times \bar{D} = \frac{-1}{C} \frac{\partial \bar{H}}{\partial t}$ and

(*iv*) $\nabla \times \bar{H} = \frac{1}{C} \left[\frac{\partial \bar{D}}{\partial t} + \rho \bar{v} \right]$

Prove that :

$$\nabla^2 \bar{D} - \frac{1}{C} \frac{\partial^2 \bar{D}}{\partial t^2} = \nabla \rho + \frac{1}{C^2} \frac{\partial}{\partial t} (\rho \bar{v}) \qquad [4]$$

7. (*a*) Find the analytic function $f(z) = u + iv$ if $2u + v = e^x (\cos y - \sin y)$. [5]

(*b*) Evaluate :

$$\int_C \frac{e^{2z}}{(z - 1)(z - 2)} dz ,$$

where C is circle $|z| = 3$. [4]

(*c*) Find the bilinear transformation which maps the points $z = -1, 0, 1$ of z-plane into the points $w = 0, i, 3i$ of w-plane. [4]

Or

8. (*a*) Find the analytic function $f(z) = u + iv$

where

$$u = r^3 \cos 3\theta + r \sin \theta.$$ [4]

(*b*) Evaluate :

$$\int_C \frac{1 - 2z}{z(z - 1)(z - 2)} dz$$

where

C is $|z| = 1.5$. [4]

(*c*) Find the map of the straight line $y = 2x$ under the transformation : [5]

$$w = \frac{z - 1}{z + 1}$$

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-1042

S.E. (E & TC/Electronics)

(First Semester) EXAMINATION, 2015

SIGNALS AND SYSTEMS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Attempt *four* questions as Question Nos. **1** *or* **2**, **3** *or* **4**, **5** *or* **6**, **7** *or* **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data if necessary.

1. (*a*) Perform the following operations on the given signal $x(t)$ which is defined as : [4]

$$x(t) = \begin{cases} -t & , \ -4 \leq t \leq 0 \\ t & , \ 0 < t \leq 2 \\ 0 & , \ \text{elsewhere} \end{cases}$$

(*i*) Sketch the signal $x(t)$

(*ii*) Sketch $z(t) = x(-t - 1)$.

P.T.O.

(*b*) Determine whether the following signals are periodic or not, if periodic find the fundamental period of the signal : [4]

(*i*) $x(t) = \cos(2t) + \sin(2t)$

(*ii*) $x[n] = \cos\left(\frac{8\pi n}{15}\right)$.

(*c*) Determine the step response of the following systems whose impulse response is : [4]

$$h(t) = e^{-5t}u(t).$$

Or

2. (*a*) Compute the convolution integral by graphical method and sketch the output for [6]

$x_1(t) = 1, \quad 0 \leq t \leq 2$

$0 \quad$ otherwise

$x_2(t) = e^{-2t}u(t)$.

(*b*) Find even and odd component of

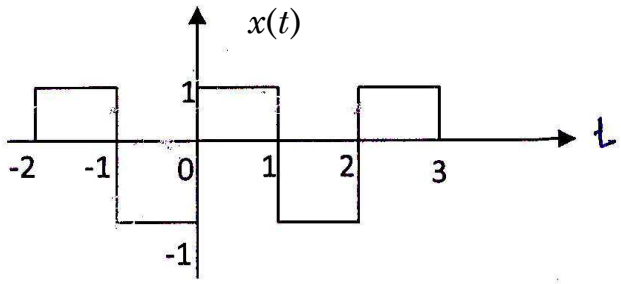
(*i*) $x(t) = u(t)$

(*ii*) $x(t) = \text{sgn}(t)$. [4]

(*c*) Determine the whether following signal is periodic or not, if periodic find the fundamental period of the signal [2]

$$x(t) = \cos^2(2\pi t).$$

3. (*a*) Find the trigonometric Fourier series for the periodic signal $x(t)$. Sketch the amplitude and phase spectra [6]



(*b*) A signal $x(t)$ has Laplace transform

$$X(s) = \frac{s + 1}{s^2 + 4s + 5}.$$

Find the Laplace transform of the following signals :

(*i*) $y_1(t) = t\ x(t)$

(*ii*) $y_2(t) = e^{-t}x(t)$. [6]

Or

4. (*a*) Find the Fourier transform of $x(t) = \text{rect}\left(\frac{t}{\tau}\right)$ and sketch the magnitude and phase spectrum. [6]

(*b*) Find the transfer function of the following : [6]

(*i*) An ideal differentiator

(*ii*) An ideal integrator

(*iii*) An ideal delay of T second.

5. (*a*) Find the following for the give signal $x(t)$:

(*i*) Autocorrelation

(*ii*) Energy from Autocorrelation

(*iii*) Energy Spectral Density :

$$x(t) = Ae^{-at}u(t).$$ [6]

(*b*) Determine the cross correlation between two sequences which are given below : [4]

$$x_1(n) = \{1 \quad 2 \quad 3 \quad 4\}$$

$$x_2(n) = \{3 \quad 2 \quad 1 \quad 0\}$$

(*c*) State and describe any *three* properties of Energy Spectral Density (ESD). [3]

Or

6. (*a*) Prove that autocorrelation and energy spectral density form Fourier transform pair of each other and verify the same for $x(t) = e^{-2t}u(t)$. [9]

(*b*) State and explain any *four* properties of Power Spectral Density (PSD). [4]

7. (*a*) Explain Gaussian probability model with respect to its density and distribution function. [4]

(*b*) Two cards drawn from a 52 card deck successively without replacing the first : [4]

(*i*) Given the first one is heart, what is the probability that second is also a heart ?

(*ii*) What is the probability that both cards will be hearts ?

(*c*) A coin is tossed three times. Write the sample space which gives all possible outcomes. A random variable X, which represents the number of heads obtained on any double toss. Draw the mapping of S on to real line. Also find the probabilities of X and plot the C.D.F. [5]

Or

8. (*a*) A random variable X is $f_x(X) = 5X^2$; $0 \leq x \leq 1$

$= 0$; elsewhere

Find E[X], E[3X – 2], $E[X^2]$. [6]

(*b*) A student arrives late for a class 40% of the time. Class meets five times each week. Find :

(*i*) Probability of students being late for at three classes in a given week.

(*ii*) Probability of students will not be late at all during a given week. [4]

(*c*) State the properties of Probability Density Function (PDF). [3]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1043

S.E. (E&TC/Electronics) (I Sem.) EXAMINATION, 2015
ELECTRONIC DEVICES AND CIRCUITS
(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.
(*ii*) Neat diagrams must be drawn wherever necessary.
(*iii*) Figures to the right indicate full marks.
(*iv*) Use of calculator is allowed.
(*v*) Assume suitable data if necessary.

1. (*a*) List the sources of instability of collector current. Explain self-bias circuit in detail. [6]

(*b*) The transistor in the given circuit is connected as a common emitter amplifier. Calculate A_v, R_i, R_o. Refer Fig. 1. Assume h_{ie} = 1.1 kΩ, h_{fe} = 50, h_{re} = 2.5 × 10^{-4}, h_{oe} = 1/40 k. [6]

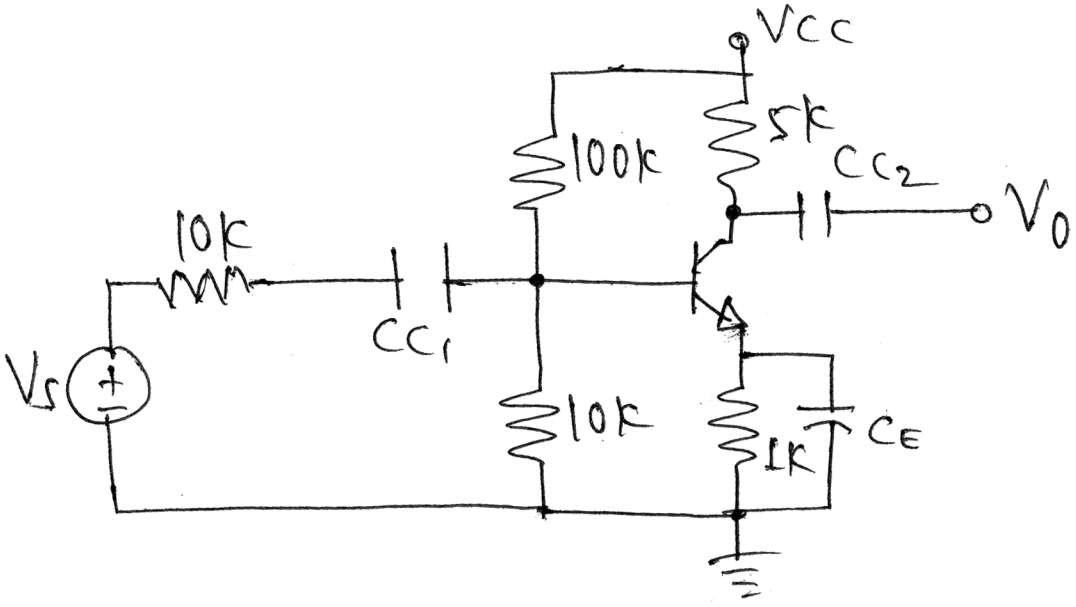


Fig. 1

P.T.O.

Or

2. (*a*) Write a short note on thermal runaway. Explain thermal stability. [6]

(*b*) Describe the method to increase the input resistance using Darlington connection. [6]

3. (*a*) Draw and explain hybrid-π common emitter transistor model. [6]

(*b*) In Colpitts oscillators L_2 = 5 μH, $C_1 = C_2$ = 0.001 μF. What will be the frequency of oscillations. If value of inductor is doubled what will be frequency of oscillations ? What should be the value of inductor to get frequency double to that of original frequency ? [6]

Or

4. (*a*) For three stage RC coupled amplifier overall upper 3 dB frequency is 16 kHz and overall lower 3 dB frequency is 25 Hz. What are the values of F_L and F_H for each stage ? Assume all stages identical. Also calculate bandwidth of each stage. [6]

(*b*) Draw and explain various topologies of negative feedback. [6]

5. (*a*) What is cross over distortion ? Describe a method to minimize this distortion. [6]

(*b*) A class-A amplifier operates from V_{CC} = 20 V, draws a no signal current of 5 Amp and feeds a load of 40 Ω, through a step up transformer of $\frac{N_2}{N_1}$ = 3.16. Find :

(*i*) Whether the amplifier is properly matched for maximum power transfer ?

(*ii*) Maximum a.c. signal power output.

(*iii*) Maximum d.c. power input.

(*iv*) Conversion efficiency at maximum signal input. [7]

Or

6. (*a*) Draw and explain complementary symmetry class-B power amplifier. [6]

(*b*) A power amplifier supplies 3 watt to a load of 6 kΩ. The zero signal d.c. collector current is 55 mA and the collector current with signal is 60 mA. How much is the percentage second harmonic distortion ? [7]

7. (*a*) Explain the following non-ideal current voltage characteristics of MOSFET :

(*i*) Body effect

(*ii*) Temperature effects

(*iii*) Breakdown effects. [6]

(*b*) Calculate the drain current and drain to source voltage of a common source circuit with an N-channel EMOSFET shown in Fig. 2. Find the power dissipated in the transistor. Given V_{TN} = 1 V and K_n = 0.1 mA/V^2. [7]

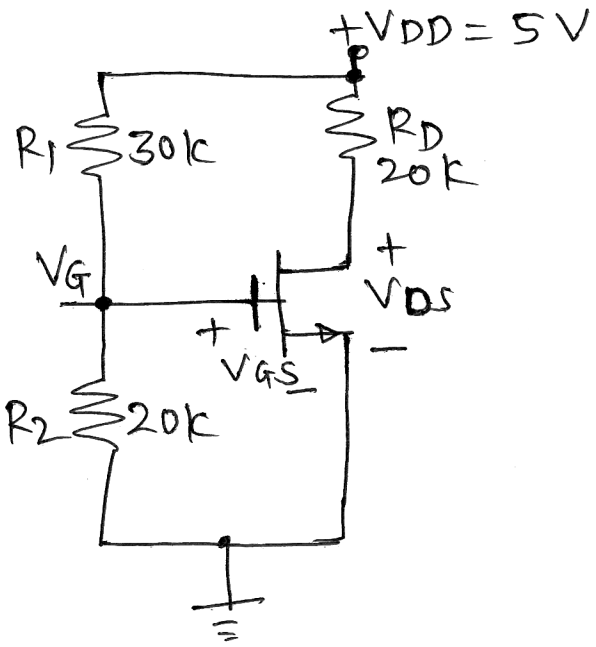


Fig. 2

Or

8. (*a*) Determine the small signal voltage gain for a CS amplifier shown in Fig. 3. Transistor parameters are V_{TN} = 2 V, K_n = 0.5 mA/V^2 and λ = 0. Assume the transistor is biased such that I_{DQ} = 0.4 mA. [7]

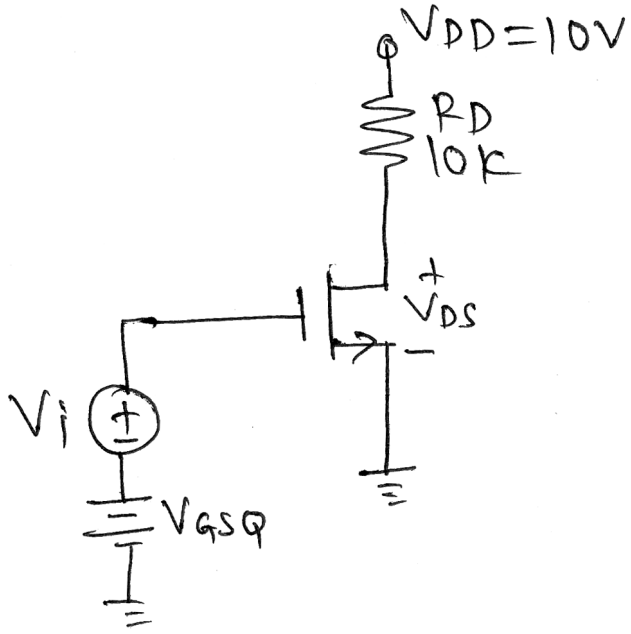


Fig. 3

(*b*) Write a short note on Bi-CMOS technology. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-1044

S.E. (Electronics & E & TC) (First Semester)

EXAMINATION, 2015

NETWORK THEORY

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Obtain Thevenin and Norton equivalent circuits for the network shown in fig. 1. [6]

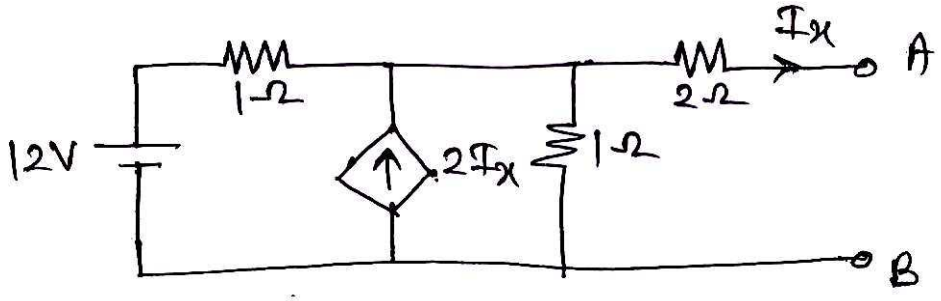


Fig. 1

P.T.O.

(*b*) For the graph and tree given in Fig. 2. find complete incidence matrix, tieset matrix and F-cutset matrix : [6]

Graph Tree

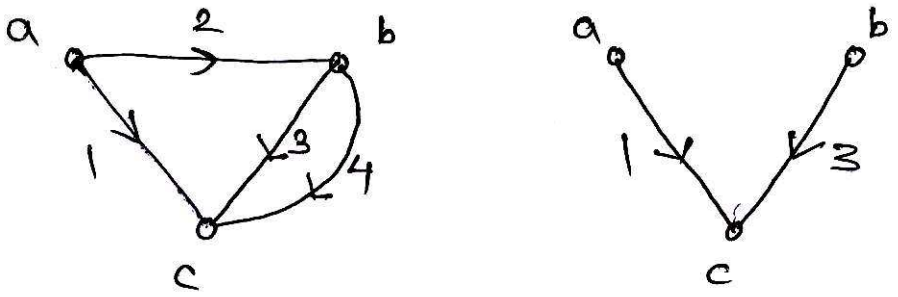


Fig. 2

Or

2. (*a*) For the network shown in Fig. 3, determine the current I_2 using superposition theorem. [6]

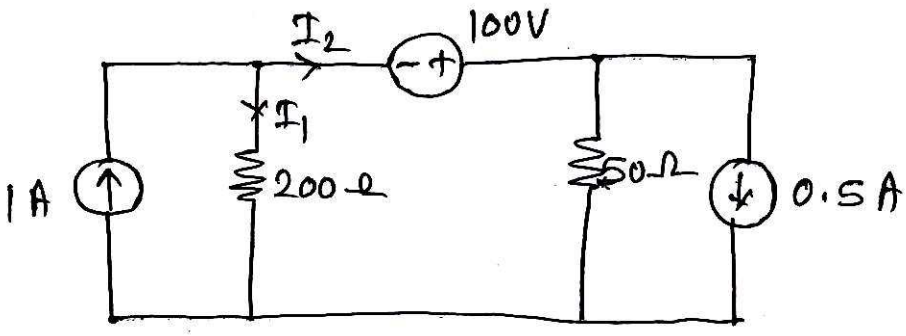


Fig. 3

(*b*) For the given incidence matrix, draw oriented graph and determine number of possible trees. [6]

$$A = \begin{bmatrix} -1 & 1 & 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & -1 & 1 & 0 \\ 0 & 0 & -1 & 1 & 0 & 1 \end{bmatrix}$$

3. (*a*) Find the expression for $V_c(t)$ in the network shown in Fig. 4. [6]

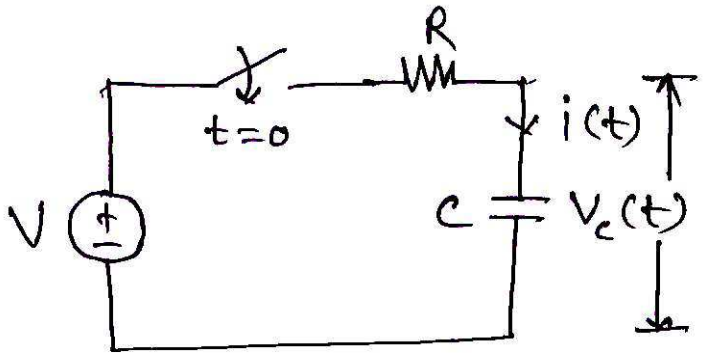


Fig. 4

(*b*) A series resonant circuit consists of R = 10 Ω, L = 100 mH and C = 10 nF. Find resonant frequency ω_r, F_r, quality factor Q_r at resonant frequency, bandwidth. Also find current flowing through circuit at resonance if the applied voltage is 100 V. [6]

Or

4. (*a*) For the network shown in Fig. 5, obtain the expression for $i_L(t)$. [6]

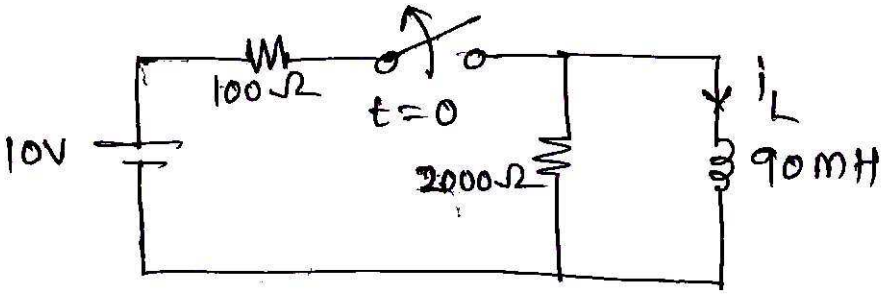


Fig. 5

(*b*) A parallel resonant circuit has a coil of 100 μH with Q factor of 100 and is resonated at 1 MHz. Find : [6]

(*i*) Capacitance

(*ii*) Resistance of coil

(*iii*) Bandwidth

(*iv*) Impedance at parallel resonance

5. (*a*) A Pi-section constant K filter consists of series arm inductance of 20 mH and two shunt arm capacitors of 0.1 μF each. Calculate cut-off frequency, attenuation at 1.5 kHz. Also find nominal impedance Z_π at $f = 0$ and $f = f_c$. [7]

(*b*) For a T-section symmetrical network derive the expression for Z_{oc}, Z_{sc} and characteristic impedance Z_o. [6]

Or

6. (*a*) For the system with 500 Ω resistance design T and Pi attenuators to have 100 dB attenuation. Also draw T and Pi attenuators showing the designed component values. [7]

(*b*) Draw the T section and Pi section contant K Band pass filter circuits and write equations for components in series arm and shunt arm. [6]

7. (*a*) Explain different network functions for one port and two port networks. [7]

(*b*) Determine Z parameters for the network shown in Fig. 6. [6]

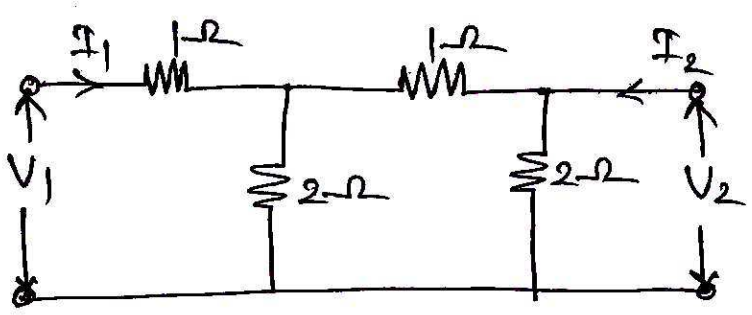


Fig. 6

Or

8. (*a*) Determine the impedance function Z(s) for the network shown Fig. 7. Also draw its pole zero plot. [7]

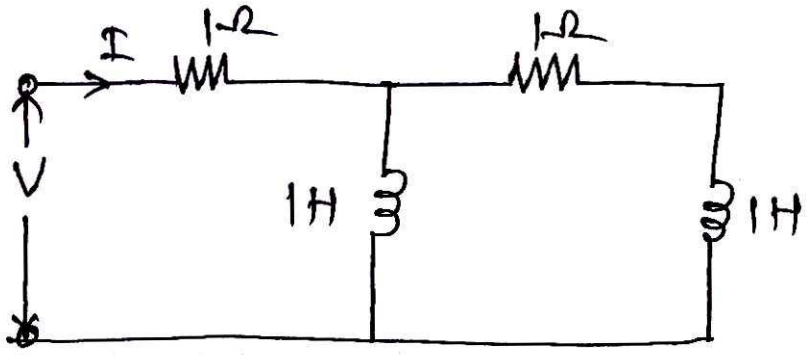


Fig. 7

(*b*) Determine Y parameters of the network shown in Fig. 8. [6]

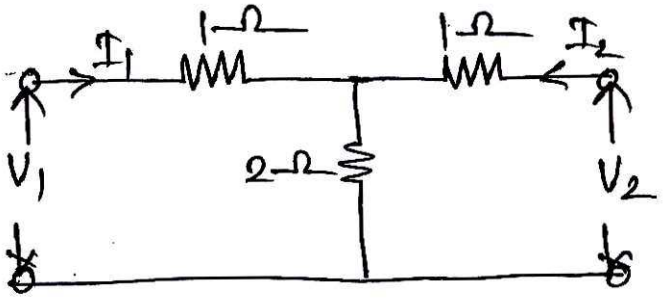


Fig. 8

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1045

S.E. (E&TC/Electronics) (First Semester) EXAMINATION, 2015
DATA STRUCTURE AND ALGORITHM
(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Assume suitable data if necessary.

1. (*a*) What do you mean by recursive function ? Explain with example. [6]

(*b*) Write a C function for insertion sort to sort integer numbers. [6]

Or

2. (*a*) Explain parameter passing by value and passing parameter by reference with suitable example. [6]

(*b*) What is pointer ? What are the advantages of using pointer ? Explain pointer declaration and its initialization with an example. [6]

3. (*a*) What is singly linked list ? Write C function for inserting a node at a given location into a Singly Linked List. [6]

P.T.O.

(*b*) Evaluate the following postfix expression using stack

$$623 + - 382/+ * 2\wedge.$$

Note : $\wedge$ stands for power and all operands are single digit. [7]

Or

4. (*a*) Write short notes on :

(*i*) Circular Linked list and

(*ii*) Doubly linked list. [6]

(*b*) What is priority queue ? Explain its implementation using any *one* method. [7]

5. (*a*) What is Binary Search Tree (BST) ? Write C functions for :

(*i*) Finding the smallest number in BST

(*ii*) Recursive inorder traversal of BST. [7]

(*b*) What is AVL Tree ? Define balance factor. Explain RR rotation with an example. [5]

Or

6. (*a*) What is Binary Search Tree (BST) ? Construct a BST for the following numbers :

27, 42, 43, 17, 39, 31, 10, 9, 19, 54, 33, 48.

Show all the steps. Write its preorder traversal. [8]

(*b*) Explain threaded binary tree with an example. What is its advantage ? [4]

7. (*a*) Write C function to implement Depth First Search traversal of a graph implemented using adjacency matrix. [6]

(*b*) What do you mean by indegree and outdegree of a vertex in a graph ? Write a C function to find indegree and outdegree of vertex in a graph implemented using adjacency matrix. [7]

Or

8. (*a*) Define the term Graph. With the help of suitable example give adjacency matrix representation and adjacency list representation of a graph. [7]

(*b*) What do you mean by spanning tree of a graph ? Find the minimal spanning tree of the following graph using Kruskal's algorithm. (Refer Fig. 1) [6]

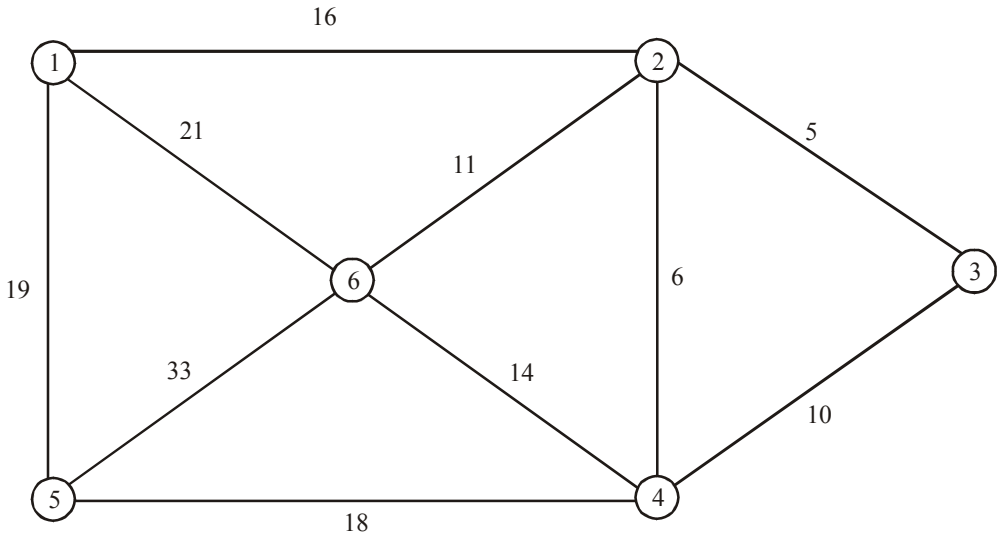


Fig. 1

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1046

S.E. (E&TC/Electronics Engineering) (Second Semester)

EXAMINATION, 2015

INTEGRATED CIRCUITS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of calculator is allowed.

(*iv*) Assume suitable data if necessary.

1. (*a*) Draw the block diagram of op-amp and explain the function of each block in detail. [6]

(*b*) Compare different types of op-amp technologies. [3]

(*c*) Explain the effect of temperature on : [3]

(*i*) Input Bias Current

(*ii*) Input Offset Voltage

(*iii*) Input Resistance.

P.T.O.

Or

2. (*a*) Find the Q-point V_C and I_B for dual input balanced output differential amplifier when, $R_E = R_C = 65\ k\Omega$. [6]

Assume $I_E = I_C$, $\beta = 100$ for both transistors Q_1 and Q_2; $V_S = \pm 12$ V.

(*b*) What is the need of frequency compensation ? Explain any *one* method of frequency compensation. [6]

3. (*a*) Design a lossy integrator with square wave input of 2 V_{p-p} and 5 kHz frequency. Draw input and output waveforms. [6]

(*b*) Explain with a neat circuit diagram working of symmetric Schmitt trigger using op-amp. Also derive the equation for the trigger points. [6]

Or

4. (*a*) Design an adder using op-amp to get output expression as : [6]

$$V_o = -(2V_1 + 3V_2 + 5V_3)$$

Where V_1, V_2 and V_3 are inputs.

(*b*) Draw and explain square wave generator using op-amp. [6]

5. (*a*) With a neat circuit diagram, explain voltage to frequency converter. [5]

(*b*) Write a short note on Binary weighted Digital to Analog Converter (DAC). [5]

(*c*) What output voltage would be proudced by a D/A converter whose output range is 0 to 10 V and input binary number is : [3]

(*i*) 10 (for a 2-bit DAC converter)

(*ii*) 0110 (for a 4-bit DAC)

(*iii*) 10111100 (for a 8-bit DAC).

Or

6. (*a*) Write a short note on Flash type Analog to Digital Converter. [5]

(*b*) What are the different types of V to I converter. Explain any *one*. [5]

(*c*) List various specifications of ADC. [3]

7. (*a*) With the help of neat block diagram explain operation of PLL. [5]

(*b*) What is the need of current boosting circuit ? Explain with the help of any *one* circuit. [5]

(*c*) Draw block diagram of frequency multiplier. Draw input-output waveforms. [3]

Or

8. (*a*) For PLL circuit shown in Fig. 1, calculate the following : [6]

(*i*) Free running frequency

(*ii*) Lock range

(*iii*) Capture range.

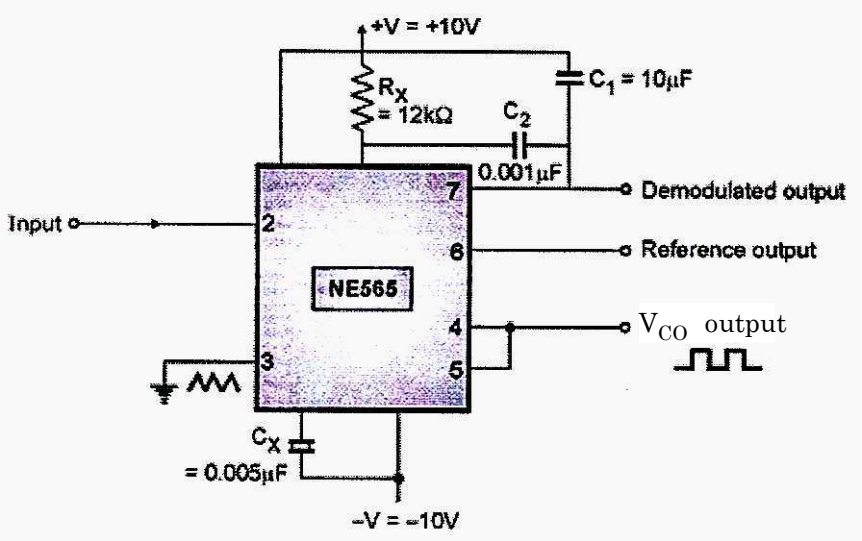


Fig. 1

(*b*) Write a short note on practical voltage regulator using LM317. [5]

(*c*) Explain the following terms : [2]

(*i*) Load Regulation

(*ii*) Line Regulation.

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-1047

S.E. (E & TC Electronics) (Second Semester)

EXAMINATION, 2015

CONTROL SYSTEMS

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Give the various terminology of electrical system and its analogous quantities based on force-current analogy. [6]

P.T.O.

(*b*) Write the differential equations of system shown in Fig. 1. Also find $\frac{X_1(s)}{F(s)}$ [6]

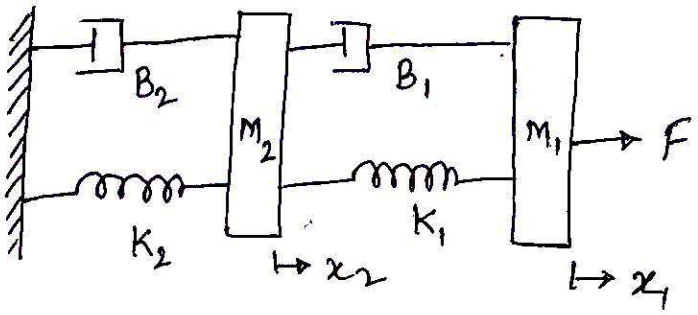


Fig. 1

Or

2. (*a*) Obtain transfer function of the system shown in Fig. 2 : [6]

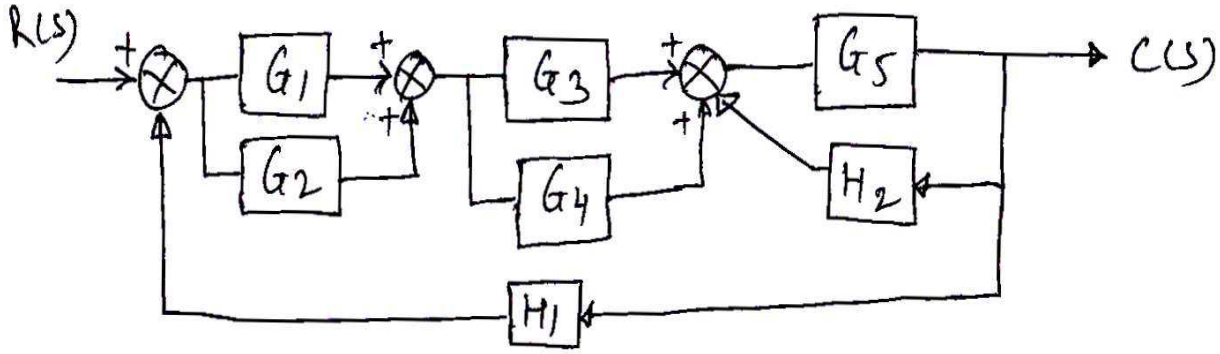


Fig. 2

(*b*) The open loop transfer function of unity feedback system is $G(s) = \frac{k_1}{s(\tau s + 1)}$ with $k, \tau > 0$ with a given value of k_1, the peak overshoot was found to be 80%. If the overshoot is decreased up to 20% by new gain k_2, find k_2 in terms of k_1. [6]

3. (*a*) Using Routh's criteria, comment on the stability if characteristic equation is : [4]

$$s^5 + 2s^4 + 3s^3 + 8s^2 + s + 1 = 0$$

(*b*) Draw the Bode plot and obtain gain margin, phase margin, gain crossover frequency and phase crossover frequency if : [8]

$$G(s) . H(s) = \frac{50{,}000\ (s + 10)}{s(s + 1)\ (s + 500)}$$

Or

4. (*a*) If

$$G(s)\, H(s) = \frac{k}{s(s + 1)\ (s + 10)}$$

sketch the complete Root locus and comment on the stability. [8]

(*b*) If

$$G(s)\, H(s) = \frac{1}{s(s + 1)}.$$

Find Resonance peak and Resonance frequency. [4]

5. (*a*) Obtain transfer function of state model if : [6]

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}, \; B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, \; C = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix}, \; D = [0]$$

(*b*) Find controllability and observability of the state model : [7]

$$A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}, \; B = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \; C = \begin{bmatrix} 1 & 1 & 1 \end{bmatrix}, \; D = [0]$$

Or

6. (*a*) Obtain state transition matrix if : [6]

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -1 & -12 \end{bmatrix} x$$

using Laplace transformation.

(*b*) With the help of general equation, explain concept of controllable canonical and observable canonical form of state space. [7]

7. (*a*) Enlist various terms in PID controller with sketch of output of P, PI, PD and PID controller for step input. [6]

(*b*) Find pulse transfer function of Fig. 3. [7]

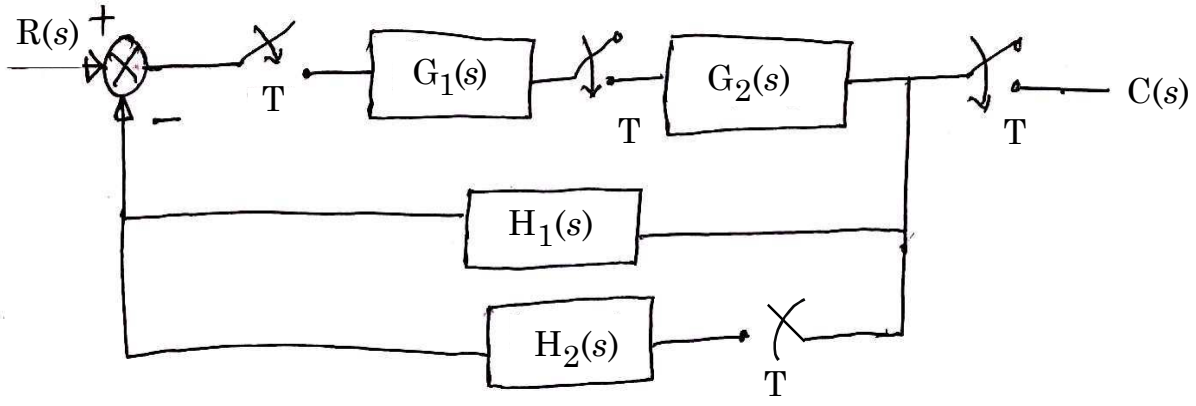


Fig. 3

Or

8. (*a*) Explain any *one* application of PLC with ladder diagram. [6]

(*b*) Obtain unit step response of the system shown in Fig. 4. [7]

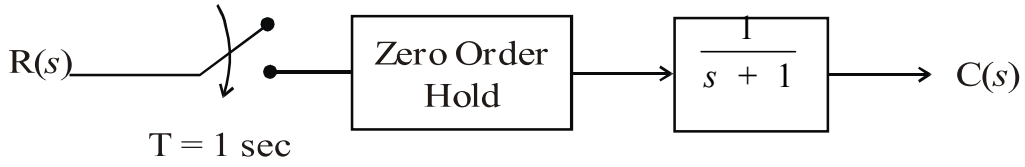


Fig. 4

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1048

S.E. (E&TC) (Second Semester) EXAMINATION, 2015

ANALOG COMMUNICATION

(2008 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right side indicate full marks.

(*iv*) Assume suitable data, if necessary.

1. (*a*) State and compare different SSB generation methods. [6]

(*b*) An angle modulated signal with carrier frequency $\omega_c = 2x \times 10^6$ is described by the equation : [6]

$$\Phi_{EM}(t) = 10 \cos (\omega_c t + 0.2 \sin 1000 \pi t)$$

(*i*) Find the power of modulated signal

(*ii*) Find the modulation index

(*iii*) Find the frequency deviation

(*iv*) Estimate the bandwidth.

P.T.O.

Or

2. (*a*) What is carrier communication ? Explain the types of the same. [6]

(*b*) Explain with the help of neat block diagram, Armstrong method of FM generation. [6]

3. (*a*) Explain with waveforms and block diagram FM super-heterodyne receiver. [6]

(*b*) Two resistors of 20 kΩ and 50 kΩ are at room temperature (290°K). For a bandwidth of 100 kHz, calculate the thermal noise voltage generated by :

(*i*) Each resistor

(*ii*) Two resistors in series

(*iii*) Two resistors in parallel. [6]

Or

4. (*a*) What is tracking ? Explain different types of tracking in radio receiver. [6]

(*b*) State various sources of noise with examples. Explain the following types of noise in detail (any *two*) : [6]

(*i*) Thermal noise

(*ii*) Low frequency noise

(*iii*) Shot noise

5. (*a*) Derive the expression for signal to noise ratio in DSB-SC system. [7]

(*b*) Explain pre-emphasis and de-emphasis in FM. [6]

Or

6. (*a*) Explain the performance of AM in presence of noise. [7]

(*b*) Derive the expression for signal to noise ratio in SSB-SC systems. [6]

7. (*a*) Explain the types of sampling with waveforms. [6]

(*b*) State and prove Sampling theorem with suitable waveforms and mathematical expression. [7]

Or

8. (*a*) With the help of neat diagram, explain PWM. [7]

(*b*) Explain band limited and time limited signal. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1049

S.E. (Electronics/E&TC) (Second Semester)

EXAMINATION, 2015

COMPUTER ORGANIZATION

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Explain different functional units of Computer Organization. [6]

(*b*) Give the IEEE standard for floating point numbers for : [6]

(*i*) single precision number

(*ii*) double precision number.

P.T.O.

Or

2. (*a*) Explain single bus structure and multi bus structure. [6]

(*b*) Represent (–13) multiple in booths record format and bit pair recorded format. [6]

3. (*a*) Write down control sequence for the instruction move (R1), R2. [6]

(*b*) Explain the following standards : [6]

(*i*) PCI

(*ii*) SCSI

(*iii*) USB.

Or

4. (*a*) Compare horizontal microinstruction and vertical micro-instruction. [6]

(*b*) Write a short note on interrupt driven Input/Output. [6]

5. (*a*) Explain cache memory. Why is it used ? [6]

(*b*) Write a note on semiconductor RAM memories. [7]

Or

6. (*a*) Write a note on a synchronous DRAM. [6]

(*b*) Explain the connection of the memory to the processor. [7]

7. (*a*) List out addressing modes of 8086. [6]

(*b*) Explain interrupt structure of 8086. [7]

Or

8. (*a*) Draw Flag Structure of 8086 and explain operation of each flag. [7]

(*b*) Explain Logical to physical addressing of 8086. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-105

S.E. (Civil) (First Semester) EXAMINATION, 2015
GEOTECHNICAL ENGINEERING
(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from Section I and *three* questions from Section II

(*ii*) Answers to the two Sections should be written in separate answer-book.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of logarithmic tables slide rule, electronic calculator is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Clearly explain the use of knowledge of geotechnical in construction of :

(*i*) Earth Dam

(*ii*) Road Construction. [6]

(*b*) Explain soil as a three-phase system. [6]

(*c*) Define the terms : Water content, state different methods to find water content of a given soil. [6]

P.T.O.

Or

2. (*a*) State the different methods to determine field density of soil. Explain any *one* of them. [6]

(*b*) A soil sample 5.20 N in wet condition and 4 N in dry condition. If its volume is found to be 270 ml than what is :

(*i*) Water content

(*ii*) Dry density (ρ_d)

(*iii*) Void ratio (*e*)

(*iv*) Degree of saturation. [6]

(*c*) What is soil exploration and List out the purpose of it. [6]

3. (*a*) Explain with neat sketch falling head permeability test. [6]

(*b*) Calculate the coefficient of permeability of a soil sample, 6 cm in height and 50 cm^2 in cross-sectional area, if quantity of water equal to 430 ml passed down in 10 minutes under an effective constant head of 40 cm. [6]

(*c*) State and explain the factors affecting permeability of soil. [4]

Or

4. (*a*) Explain with neat sketch Constant head permeability test. [6]

(*b*) In a falling head permeability test on a silty clay sample, the following result were obtained : Sample length 120 mm, sample diameter 80 mm, initial head 1200 mm, final head 400 mm, time for fall in head 6 minutes, stand pipe diameter is 4 mm. Find the coefficient of permeability of soil in mm/sec. [6]

(*c*) What are the properties of flow net ? [4]

5. (*a*) State and explain any *four* factors which influence compaction of soil. [6]

(*b*) Draw a moisture density curve and obtained MDD and OMC with the following records : [6]

Bulk wt. Density (kN/m^3)	**Water Content** %
16.50	10
17.80	13
19.50	16.5
19.80	20
18.50	24.5
18.00	29

(*c*) What is pressure bulb ? Explain its use. [4]

Or

6. (*a*) Write a short note on Neutral and effective Stress. [6]

(*b*) Explain the following methods of stress distribution in soil : [6]

(*i*) Equivalent point load method

(*ii*) Approximate stress distribution method.

(*c*) State Boussinesq's equation for analysis for stress distribution in soil due to a concentrated load and meaning of all terms. [4]

SECTION II

7. (*a*) Write a note on Vane Shear Test. [6]

(*b*) What are the advantages and disadvantages of direct share test. [6]

(*c*) The shear strength parameters of a given soil are, C = 0.26 kg/cm^2 and ϕ = 21°. Undrained triaxial tests are to be carried out on specimens of this soil. Determine deviator stress at which failure will occur if the cell pressure be 2.5 kg/cm^2. [6]

Or

8. (*a*) What are the three standard triaxial shear tests with respect of drainage condition ? [6]

(*b*) What are the factors affecting shear strength of soil ? [6]

(*c*) A Vane 10.8 cm long 7.2 cm in diameter, was pressed in to the soft clay at the bottom of the bore hole. Torque was applied and value at failure was 45 Nm. Find the shear strength of the clay on a horizontal plane. [6]

9. (*a*) State assumption in Rankine's earth pressure theory. [6]

(*b*) What is Taylor's stability numbers ? What is its utility in the analysis of stability of slopes. [6]

(*c*) Define the terms Active Earth Pressure, Passive Earth Pressure with sketches. [4]

Or

10. (*a*) What is 'earth pressure at rest' and state equation for the same. [6]

(*b*) Differentiate between Rankine's and Coulomb's theories of earth pressure. [6]

(*c*) Explain effect of wall moment with respect to earth pressure. [4]

11. (*a*) What are different modes of failure of rocks ? [6]

(*b*) Explain durability of rocks. [4]

(*c*) Write short notes on :

(*i*) Porosity of rocks

(*ii*) Permeability of rocks. [6]

Or

12. (*a*) What are different index properties of rocks ? [6]

(*b*) Write short notes on :

(*i*) Geological classification of rocks

(*ii*) Shear strength of rocks. [10]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1050

S.E. (Elex/E & TC) (First Semester) EXAMINATION, 2015

DIGITAL ELECTRONICS

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Figures to the right indicate full marks.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Assume suitable data, if necessary.

1. (*a*) Draw and explain the working of two input TTL NAND gates (with totem pole). [6]

(*b*) Implement the following function using single 8 : 1 MUX. [6]

$F(A, B, C, D) = \Sigma m\ (1, 4, 6, 8, 10, 11, 13, 14)$

Or

2. (*a*) Design and implement full adder using suitable decoder. [6]

(*b*) Draw and explain the working of 2 i/p CMOS NOR gate. [6]

P.T.O.

3. (*a*) Design mod 6 ripple up counter using T flip-flops. [6]

(*b*) Convert D to T and vice versa. [6]

Or

4. (*a*) Explain moore circuit with example. Also compare moore and mealy circuit. [6]

(*b*) Design a sequence detector to detect sequence 1101 using D FF and mealy machine. [6]

5. (*a*) Compare between PROM and PAL. [5]

(*b*) A combinational circuit is defined by a function $F_1 = \Sigma m(1, 3, 5)$ $F_2 = \Sigma m\ (5, ,6, 7)$.

Implement the circuit with PLA having 3 inputs, 3 product terms and two outputs. [8]

Or

6. (*a*) Explain in detail the architecture of CPLD. [6]

(*b*) What is meant by EPROM ? State its advantages and disadvantages. [7]

7. (*a*) Explain the following statements with examples : [6]

(*i*) Process

(*ii*) Case

(*iii*) If else

(*b*) Write a VHDL code for 8 : 1 multiplexer using behavioural modeling. [7]

Or

8. (*a*) Explain in detail signal and variable with example in VHDL. [6]

(*b*) Write a VHDL code for 4-bit ALU using case statement. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1052

S.E. (Instrumentation & Control)

(First Semester) EXAMINATION, 2015

SENSORS AND TRANSDUCERS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Assume suitable data if necessary.

(*iv*) *All* questions are compulsory.

1. (*a*) Explain the classification of transducers with suitable example. [4]

(*b*) Explain how the potentiameter can be used for measurement of rotary displacement. [4]

(*c*) Explain an application in which LVDT acts as secondary transducer. [4]

Or

2. (*a*) Explain the set up along with suitable transducer for very medium distance measurement. [4]

P.T.O.

(*b*) Enlist various strain gauge compensation techniques ? Explain any *one* with neat sketch. [4]

(*c*) Explain Magnetostrictive Torsion Transducer ? [4]

3. (*a*) What are different elastic pressure transducers ? Explain any *one* in detail. [4]

(*b*) Draw the neat sketch of dead weight tester. [4]

(*c*) Explain working of ring balance type DP instrument with neat sketch. [4]

Or

4. (*a*) What are different sources of errors and their remedies in filled system thermometers ? How they are overcome ? [6]

(*b*) Explain working of bimetallic strip with neat sketch. State its applications. [6]

5. (*a*) What are Newtonian and non-Newtonian Fluids explain with suitable examples. [6]

(*b*) Discuss what is the need for square root extractor in restriction type flow meters ? Draw the sketches of Eccentric, segmental and concentric type orifice plates. [7]

Or

6. (*a*) Derive Bernoulli's equation for incompressible flow. [8]

(*b*) What is Laminar and Turbulent flow ? How is it decided ? [5]

7. (*a*) Write Nernst equation. Explain pH Temperature compensation in detail. [7]

(*b*) Explain chain-balanced float type Density Measurement device with sketch. [6]

Or

8. (*a*) Explain Saybolt viscometer in detail. [6]

(*b*) Explain capacitive type DP cell in detail. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1053

S.E. (Instrumentation and Control Engineering)

(I Sem.) EXAMINATION, 2015

LINEAR INTEGRATED CIRCUITS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Solve Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Figures to the right indicate full marks.

1. (*a*) Define any *six* characteristics of Op-amp with ideal and Practical values. [6]

(*b*) Explain the advantages of closed loop OP-AMP. Also explain unity gain amplifier with neat circuit diagram. [6]

Or

2. (*a*) Explain measurement of the Common Mode Rejection Ratio of Op-amp with neat circuit diagrams. [6]

(*b*) Derive the output voltage equation for the voltage-shunt feedback amplifier with neat circuit diagram. [6]

P.T.O.

3. (*a*) Explain 3-input non-inverting voltage summer with equation and neat circuit diagram. [6]

(*b*) What is oscillator ? State Barkhausen criteria and design Phase shift oscillator for f_0 = 1 kHz with neat circuit diagram. Assume suitable data. [6]

Or

4. (*a*) Explain with neat circuit diagrams and equations, limitations of basic Integrator and how it can be overcome by practical Integrator. [6]

(*b*) Explain Window detector using IC LM 311 with neat circuit diagram and waveforms. [6]

5. (*a*) Design Astable Multivibrator for the duty cycle of 78% and frequency of 1.2 kHz. Assume suitable values. Also draw circuit diagram and waveforms. [8]

(*b*) Draw and design low voltage regulator using IC 723 for 5 V. Assume suitable data. [5]

Or

6. (*a*) Explain Mono-stable multivibrator using IC 555 with neat circuit diagrams. [5]

(*b*) Explain step-down switching regulator. Also state its advantages over linear regulators. [8]

7. (*a*) Explain second order Butterworth low-pass filter and also draw circuit diagram. [8]

(*b*) What is order of filter ? Draw ideal and practical responses for all filters. [5]

Or

8. (*a*) Explain notch filter using Op-amp and draw circuit diagram and response. [6]

(*b*) Design first order High-pass filter for the low cut-off frequency of 500 Hz. Assume suitable data. Draw neat circuit diagrams. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1054

S.E. (Instrumentation and Control)
(First Semester) EXAMINATION, 2015
BASIC INSTRUMENTATION
(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Solve Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8.**

(*ii*) Figures to the right indicate full marks.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Explain the dynamic characteristics of instruments. [6]

(*b*) Draw the circuit diagram of basic DC potentiometer. If a DC potentiometer is calibrated having length of slidewire 400 cm, at 100 cm for 200 mV what will be the measurement range ? Also calculate the unknown emf if the null deflection is at 286.5 cm. [6]

Or

2. (*a*) Explain calibration, traceability and traceability chart. [6]

(*b*) Design multirange ammeter by universal shunt method that uses a basic PMMC meter having R_m = 2.3 kΩ and I_{fsd} = 500 μA. The desired range are 5 mA, 20 mA and 50 mA. [6]

P.T.O.

3. (*a*) With neat circuit diagram explain Hay's Bridge. [6]

(*b*) Write a note on Z-modulation. How is it used for unknown frequency measurement ? [6]

Or

4. (*a*) Explain the function of Aquadag, Vertical Deflecting Plates and Focus anode in CRO. [6]

(*b*) An AC bridge consists of the following arms : [6]

Arm ab – resistance of 800 = parallel to capacitance 0.5 μF

Arm bc – resistance of 1200 = in series with capacitance 0.5 μF

Arm cd – resistance of 300 = in series with inductance 40 mH

If the frequency of supply is 100 Hz, calculate component value in arm da as a series combination of resistance and inductance.

5. (*a*) Explain with the help of block diagram, digital phase meter. [7]

(*b*) Draw block diagram of DMM. How resistances (low and high values) are measured in DMM ? [6]

Or

6. (*a*) Explain the digital tachometer. [7]

(*b*) What are the different blocks required for Digital Thermometer ? Explain with neat block diagram. [6]

7. (*a*) With appropriate circuit, explain how a triangular input wave will be converted into sine wave. [7]

(*b*) Explain any *three* marking mechanisms in recorders. [6]

Or

8. (*a*) Write a short note on Virtual Instrumentation. [6]

(*b*) What are the desirable characteristics of waveform generator ? Draw and explain block diagram of function generator. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1055

S.E. (Instru. & Control) (First Semester) EXAMINATION, 2015
PHOTONICS AND INSTRUMENTATION
(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right side indicate full marks.

(*iv*) Assume suitable data if necessary.

1. (*a*) Draw electromagnetic spectrum of light and show different ranges. [8]

(*b*) State Planck's equation and Snell's Law. [4]

Or

2. (*a*) Calculate the frequency for the wavelength of 50 mm. [4]

(*b*) Compare the following terms : [8]

(*i*) Reflection and Refraction

(*ii*) Diffraction and Interference.

P.T.O.

3. (*a*) For an Incandescent lamp the design parameters are : [4]

(*i*) Design voltage = 5 V

(*ii*) Rated M.S.C.P. = 0.145

(*iii*) Operated at 4.5 V, then calculate :

(I) Rerated M.S.C.P.

(II) Reduction factor of lamp when M.H.S.C.P. = 0.725.

(*b*) Explain the following terms related to Light Emitting Diode : [8]

(*i*) Electroluminescent Process

(*ii*) Choice of LED Material

(*iii*) Applications of LED.

Or

4. (*a*) What is Quantum detector ? Explain any *one* type of Quantum detector. [8]

(*b*) Explain with neat diagram Photomultiplier Tube. [4]

5. (*a*) What is Attenuation ? Explain different losses in fibre cable. [7]

(*b*) Explain the following terms : [6]

(*i*) Acceptance Angle

(*ii*) Numerical Aperture.

Or

6. (*a*) What is wave guiding principle ? Explain the term skew rays. [6]

(*b*) What are the different modes used in fibre optics ? Explain with diagram. [7]

7. (*a*) Explain with suitable diagram working of Microscope. [7]

(*b*) Explain OTDR with suitable diagram. [6]

Or

8. (*a*) Explain camera with suitable diagram. [7]

(*b*) Explain Polarimeter with a neat diagram. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[4757]-1056

S.E. (Instrumentation & Control) (Second Semester)

EXAMINATION, 2015

DIGITAL TECHNIQUES

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Solve Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** and Q. No. **7** *or* Q. No. **8.**

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data if necessary.

1. (*a*) Convert the following : [6]

(*i*) $(77466)_8$ to hexadecimal number

(*ii*) $(BACF9.61C)_{16}$ to binary number

(*iii*) $(11001111011110110111)_2$ to hexadecimal number.

(*b*) Compare TTL and CMOS. [6]

Or

2. (*a*) Convert the following : [6]

(*i*) $(2ACS.D)_{16}$ to decimal number

(*ii*) $(22.64)_{10}$ to hexadecimal number

(*iii*) $(725.63)_8$ to binary number.

(*b*) Compare totem-pole and open collector. [6]

P.T.O.

3. (*a*) Design a code gray to binary. [6]

(*b*) Implement the following using 8 : 1 mux : [6]

$F(A, B, C, D) = \Sigma m(0, 2, 6, 10, 11, 12, 13) + d(3, 8, 14)$.

Or

4. (*a*) Convert JK to T flip-flop. [6]

(*b*) Implement $F(A, B, C) = \Sigma m(1, 3, 5, 6)$ using 4 : 1 mux. [6]

5. (*a*) Design PROM for 3 bit binary to Ex-3 code. [8]

(*b*) Write a short note on PROM. [5]

Or

6. (*a*) Compare ASIC and PLD approach. [8]

(*b*) Write a short note on PLA. [5]

7. (*a*) Explain digital clock with a neat diagram. [8]

(*b*) Write a short note on RAM. [5]

Or

8. (*a*) Write a short note on frequency counter. [8]

(*b*) Write a short note on ROM. [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1057

S.E. (Instrumentation and Control) (Second Semester)

EXAMINATION, 2015

AUTOMATIC CONTROL SYSTEM

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Solve Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of non-programable calculator is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Determine the overall transfer function of the system shown in Fig. 1 using block diagram reduction technique. [6]

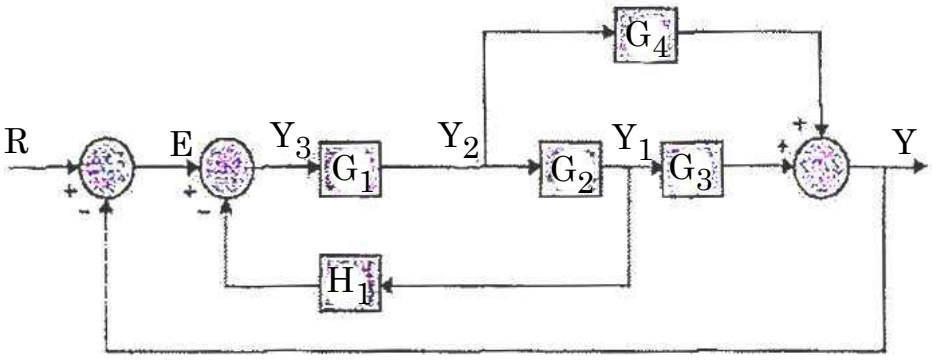


Fig. 1 : Block Diagram

(*b*) Derive the transfer function of RLC electrical system. [6]

P.T.O.

Or

2. (*a*) Determine the overall transfer function of the system shown in Fig. 1 using Mason's gain formula. [6]

(*b*) Derive the transfer function of mechanical (mass, spring and dashpot) system. [6]

3. (*a*) Prove that : [6]

$$e_{ss} = \lim_{s \to 0} \frac{sR(s)}{1 + G(s)H(s)}.$$

(*b*) A system is excited with unit step input has a time response : [6]

$$c(t) = 1 + 0.5e^{-50t} - 1.5e^{-t}$$

- Find the transfer function of the system
- Determine ω_n and ζ
- Determine time constant of the system.

Or

4. (*a*) A unity feedback system has an open loop transfer function :

$$G(s) = \frac{K}{s(s + 10)}.$$

Determine the gain K so that the system will have a damping factor of 0.7. For this value of K determine T_s (for 2% tolerance band) and peak time of the system. [4]

(*b*) Open loop transfer function of the system is :

$$G(s) = \frac{k}{s(s + 4)(s + 6)}.$$

Draw its root locus and comment on stability of the system. [8]

5. Magnitude plot of a frequency response is as shown in Fig. 2. Frequency axis is in rad/sec. Determine gain margin, phase margin and comment on stability. [13]

Or

6. Open loop transfer of a unity feedback system is :

$$G(s) = \frac{200(s+1)}{s(s+10)(s+20)}.$$

Draw its Bode plot and determine gain margin and phase margin and also comment on stability. [13]

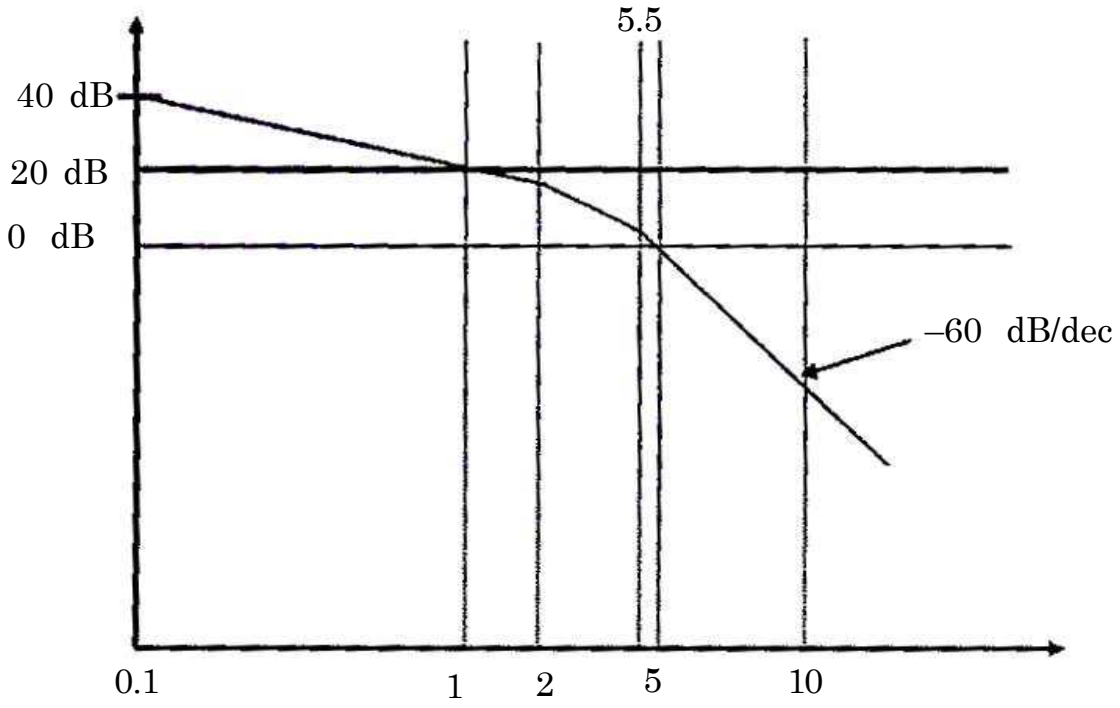


Fig. 2 : Magnitude plot of frequency response

7. (*a*) Sketch the approximate polar plot for the following system : [8]

$$G(s) = \frac{k}{s + p_1}$$

and

$$G(s) = \frac{k}{s(s + p_1)}.$$

(*b*) Write a short note on mapping theorem. [5]

Or

8. (*a*) Sketch the approximate polar plot for the following systems : [8]

$$G(s) = \frac{k}{s}$$

and

$$G(s) = \frac{k}{s^2}.$$

(*b*) Write a short note on mapping theorem. [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1058

S.E. (Instrumentation & Control) (Second Semester)

EXAMINATION, 2015

TRANSDUCER AND SIGNAL CONDITIONING

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Solve Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right candidate indicate full marks.

(*iv*) Use of electronic pocket calculator is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Explain signal level and bias changes in analog signal conditioning. [3]

(*b*) Explain lead compensation in signal conditioning. [3]

(*c*) Explain block diagram of RTD signal conditioning circuit used for temperature measurement application. [6]

P.T.O.

Or

2. (*a*) Discuss voltage divider and Bridge circuit for conversion of resistive sensors output in voltage signal. [6]

(*b*) Explain signal conditioning circuits required for potentiometer sensor for level measurement. [6]

3. (*a*) Explain capacitance to voltage converter in detail. [6]

(*b*) Explain inductive proximity sensor with its signal conditioning blocks and also explain importance of each block. [6]

Or

4. (*a*) With neat sketch explain capacitive proximity sensor. [6]

(*b*) Explain excitation techniques used for inductive sensors. [6]

5. (*a*) In short explain signal conditioning circuits for photo diode and photo transistor. [7]

(*b*) Explain pyrometers with neat sketches. [6]

Or

6. (*a*) Explain optical encoder and its signal conditioning circuit blocks. [7]

(*b*) Explain optical proximity sensor circuits. [6]

7. (*a*) Explain signal conditioning circuit blocks used in ultrasonic level detector. [7]

(*b*) Explain Hall effect sensor and its signal conditioning circuit. [6]

Or

8. (*a*) Discuss different excitation methods for electromagnetic flowmeter. [7]

(*b*) Draw and explain block diagram of conductivity meter. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1059

S.E. (Instrumentation and Control) (Second Semester)

EXAMINATION, 2015

ELECTRONIC INSTRUMENTATION

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Solve Q. **1** *or* Q. **2**, Q. **3** *or* Q. **4**, Q. **5** *or* Q. **6**, Q. **7** *or* Q. **8**.

(*ii*) Figures to the right indicate full marks.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Explain RLC-Q meter with neat block diagram. [6]

(*b*) Draw and explain ramp generator circuit using timer IC 555. [6]

P.T.O.

Or

2. (*a*) Draw and explain block diagram of digital frequency meter. [6]

(*b*) Draw and explain block diagram of Indirect frequency synthesis. [6]

3. (*a*) Explain details of 1 : 1 and 10 : 1 types of Passive probes. [6]

(*b*) Draw and explain block diagram of 3-bit Flash type ADC. [6]

Or

4. (*a*) Explain any *two* Modes of DSO. [6]

(*b*) Explain 4-bit R-2R type DAC using neat circuit diagram. [6]

5. (*a*) Explain the concept of Amplitude Modulation using neat waveforms. [7]

(*b*) Describe FDM concept using neat block diagram. [6]

Or

6. (*a*) Explain the modulation concept using Frequency Shift Keying. [7]

(*b*) Explain frequency modulation technique using neat waveforms. [6]

7. (*a*) Draw and explain working principle of fundamental suppression type distortion analyzer. [7]

(*b*) Explain Super-heterodyne type spectrum analyzer with neat block diagram. [6]

Or

8. (*a*) Explain TRF spectrum analyzer with neat block diagram. [7]

(*b*) Draw and explain block diagram of frequency selective wave analyzer. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-106

S.E. (Civil Engineering) (Second Semester) EXAMINATION, 2015
CONCRETE TECHNOLOGY
(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-book.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Your answers will be valued as a whole.

(*vi*) Use of electronic pocket calculator is allowed.

(*vii*) Assume suitable data if necessary.

(*viii*) Use of IS code 10262,456 is not allowed.

SECTION I

1. (*a*) List various types of cement. Explain any *two* briefly. [6]

(*b*) Write a short note on classification of Aggregates. [6]

(*c*) Write a short note on fly ash. [5]

P.T.O.

Or

2. (*a*) What are the minor compounds in Portland cement ? State the significance of each compound. [6]

(*b*) Explain Alkali-aggregate reaction. State factors promoting and control of the reaction. [6]

(*c*) What are the different functions of admixtures ? [5]

3. (*a*) What are different methods to measure workability ? Explain any *one* in detail. [6]

(*b*) State and explain various operations involved during the concreting from mixing to finishing of concrete surface. [6]

(*c*) Write short notes on : [5]

(*i*) Shrinkage

(*ii*) Swelling.

Or

4. (*a*) Define workability. Explain the factors affecting workability. [6]

(*b*) Write short notes on : [6]

(*i*) Bleeding

(*ii*) Segregation.

(*c*) Explain in detail the importance of compaction of concrete. What are the different methods of compaction ? [5]

5. (*a*) What do you mean by concrete mix design ? What are the objectives in mix design ? [6]

(*b*) Explain mix design by IS recommended guidelines in detail. [6]

(*c*) Define Nominal mix and Design mix. [4]

Or

6. (*a*) Explain the factors governing the selection of mix proportions. [6]

(*b*) Explain DOE method of mix design in brief. [6]

(*c*) What do you mean by : [4]

(*i*) Mean strength

(*ii*) Variance

(*iii*) Standard deviation

(*iv*) Coefficient of variation.

SECTION II

7. (*a*) Enlist basic members required for formwork. [4]

(*b*) Write short notes on : [12]

(*i*) Rebound hammer test

(*ii*) Pullout test

(*iii*) Ultrasonic pulse velocity test.

Or

8. (*a*) What are the test cores ? What are the advantages and disadvantages of test cores ? [4]

(*b*) Explain briefly principles of design of formwork. [6]

(*c*) Write short notes on : [6]

(*i*) Impact echo test

(*ii*) Marsh cone test.

9. Write short notes on : [16]

(*i*) Light weight concrete

(*ii*) Self-compacting concrete

(*iii*) Ready Mixed concrete

(*iv*) Ferro cement.

Or

10. Write short notes on : [16]

(*i*) Fibre reinforced concrete

(*ii*) High Density concrete

(*iii*) Roller compacted concrete

(*iv*) Underwater concreting.

11. (*a*) Explain various reasons of cracking of hardened concrete. [6]

(*b*) Write short notes on : [12]

(*i*) Shotcrete

(*ii*) Evaluation of cracks

(*iii*) Sulphate attack on concrete.

Or

12. (*a*) State and explain factors affecting permeability of concrete. [6]

(*b*) Explain process of preparation of surface for repairs along with its importance. [6]

(*c*) Write short notes on : [6]

(*i*) Carbonation of concrete

(*ii*) Repair of stitching.

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1060

S.E. (Instrumentation and Control) (Second Semester)

EXAMINATION, 2015

INDUSTRIAL DRIVES

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Solve Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Explain with neat diagram construction of IGBT. [6]

(*b*) Explain in detail 1-ϕ full controlled bridge rectifier with resistive load. [6]

P.T.O.

Or

2. (*a*) Explain with neat diagram Jones Chopper. [6]

(*b*) Explain with neat diagram working of 1-ϕ full bridge inverter. [6]

3. (*a*) Derive the EMF equation of DC generator. [6]

(*b*) Derive the torque equation of 3-ϕ induction motors. [6]

Or

4. (*a*) What is the significance of back EMF ? [6]

(*b*) Write a short note on speed control of induction motor. [6]

5. (*a*) Explain with neat diagram working principle of Alternators. [7]

(*b*) Explain with neat diagram working principle of 1-ϕ induction motors. [6]

Or

6. (*a*) Write a short note on synchronous motors. [7]

(*b*) Explain Torque-Speed characteristics of 1-ϕ induction motors. [6]

7. (*a*) Explain construction and working principle of stepper motor. [8]

(*b*) Explain Torque-Speed characteristics of servomotors. [5]

Or

8. (*a*) What is the need of stepper motor in industrial automation ? Specify its *two* applications. [6]

(*b*) Explain construction and working principle of Universal motors. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-1061

S.E. (Chemical/Printing Engineering) (First Semester)

EXAMINATION, 2015

ENGINEERING MATHEMATICS-III

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** and Q. No. **7** *or* Q. No. **8**.

(*ii*) Figures to the right side indicate full marks.

(*iii*) Use of non-programmable calculator is allowed.

(*iv*) Assume suitable data if necessary.

1. (*a*) Solve any *two* : [8]

(*i*) $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} + 4y = \cos(\log x)$

(*ii*) $\frac{d^2y}{dx^2} + y = \sec x$ (by method of variation of parameters)

(*iii*) $\frac{dx}{3z - 4y} = \frac{dy}{4x - 2z} = \frac{dz}{2y - 3x}$

P.T.O.

(*b*) Solve the integral equation : [4]

$$\int_0^\infty f(x) \cos \lambda x dx = \begin{cases} 1 - \lambda, & 0 \leq \lambda \leq 1 \\ 0 & , \quad \lambda \geq 1 \end{cases}$$

Or

2. (*a*) A 1 kg weight suspended from a spring stretches it 4 cm. If the weight is pulled down 8 cm below the equilibrium position and then released, find the displacement of the body from its equilibrium position in time *t* seconds, the maximum velocity and period of oscillation. [4]

(*b*) Using Fourier integral representation, show that : [4]

$$\int_0^\infty \frac{1 - \cos \pi\lambda}{\lambda} \sin \lambda x \ d\lambda = \begin{cases} \frac{\pi}{2}, & 0 < x < \pi \\ 0, & x > \pi \end{cases}$$

(*c*) Find the Fourier cosine transform of : [4]

$$f(x) = \begin{cases} x, & 0 < x < \frac{1}{2} \\ 1 - x, & \frac{1}{2} < x < 1 \\ 0, & x > 1 \end{cases}$$

3. (*a*) Attempt any *one* : [4]

(*i*) Find Laplace transform of :

$$e^{-3t}\int_0^t t \sinh 2t \, dt.$$

(*ii*) Find inverse Laplace transform of :

$$\log\left(\frac{s^2 + b^2}{s^2 + a^2}\right).$$

(*b*) Solve by Laplace transform : [4]

$$\frac{d^2y}{dt^2} + y = t, \text{ given } y(0) = 1, \; y'(0) = -2.$$

(*c*) Find directional derivative of $\phi = e^{2x - y - z}$ at (1, 1, 1) along the direction of tangent to curve : [4]

$x = e^{-t}, y = 2\sin t + 1, z = t - \cos t$ at $t = 0$.

Or

4. (*a*) Attempt any *one* : [4]

(*i*) Prove that :

$$\nabla \cdot \left[r\nabla\left(\frac{1}{r^n}\right)\right] = \frac{n(n-2)}{r^{n+1}}$$

(*ii*) If ϕ and ψ satisfies Laplace equation then prove that $(\phi \nabla \psi - \psi \nabla \phi)$ is solenoidal.

(*b*) If vector field : [4]

$$\bar{F} = (x + 2y + az)\,\bar{i} + (bx - 3y - z)\bar{j} + (4x + cy + 2z)\bar{k}$$

is irrotational. Find a, b, c and scalar function ϕ such that $\bar{F} = \nabla\phi$

(*c*) Using Laplace transform evaluate : [4]

$$\int_0^\infty e^{-t}\,(1 + 2t + t^2)\;U(t - 1)dt\,.$$

5. (*a*) Evaluate :

$$\int_C \bar{F}\,.\,d\bar{r}$$

where $\bar{F} = z\bar{i} + xz\,\bar{j} + (x - 2yz)\bar{k}$ along the curve $x = t$, $y = t^2$, $z = t^3$ from $t = 0$ to $t = 1$. [4]

(*b*) By using Gauss-Divergence theorem evaluate $\iint_S (\cos y\,\bar{i} + z^2 \sin x\,\bar{j} + z\,\bar{k}).\,d\bar{s}$ over the cylindrical region bounded by $x^2 + y^2 = 4, z = 0, z = 3$. [5]

(*c*) Evaluate :

$$\iint_S (\nabla\,.\,\bar{F})\;.\;d\bar{s}$$

where $\bar{F} = (x - z^2)\bar{i} + (y - 3x)\bar{j} + z^3 y\bar{k}$, s is the surface $x^2 + y^2 + z^2 - 4z = 1$ above the plane $z = 0$. [4]

Or

6. (*a*) Use Green's theorem to evaluate : [4]

$$\int_C \bar{F} \cdot d\bar{r}$$

where $\bar{F} = y^3\bar{i} - x^3\bar{j}$ and C is the circle $x^2 + y^2 = 4$.

(*b*) Evaluate :

$$\iint_S [(3x)\,\bar{i} + x^3 \sin z\,\bar{j} + (y^2 \cos x)\bar{k}] . d\bar{s}$$

over the surface of sphere $x^2 + y^2 + z^2 = 1$. [4]

(*c*) Use Stokes' theorem to evaluate :

$$\oint_C (x + 2y)dx + (x - z)dy + (y - z)dz$$

where C is the boundary of triangle with vertices (1, 0, 0), (0, 1, 0), (0, 0, 1). [5]

7. (*a*) If

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$$

represents the vibrations of string of length l fixed at both ends, find the solution with boundary conditions : [7]

(i) $u(0, t) = 0$

(ii) $u(l, t) = 0$ and initial conditions.

(iii) $\left(\frac{\partial u}{\partial t}\right)_{t=0} = 0$

(iv) $u(x, 0) = u_0 \sin\left(\frac{2\pi x}{l}\right), \ 0 \leq x \leq l$

(b) Solve :

$$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2} \text{ if}$$

(i) u is finite for all t,

(ii) $u(0, t) = 0$

(iii) $u(l, t) = 0$

(iv) $u(x, 0) = \frac{2x}{l}, \ 0 \leq x \leq l$ [6]

Or

8. (a) An infinitely long uniform metal plate is enclosed between lines $y = 0$ and $y = 4$ for $x > 0$. The temperature is zero along the edges $y = 0$, $y = 4$ and at infinity. If the edge $x = 0$ is kept at a constant temperature 50°C, find the temperature distribution $u(x, y)$ [7]

(*b*) Use Fourier transform to solve :

$\frac{\partial u}{\partial t} = 4\frac{\partial^2 u}{\partial x^2}$, $0 < x < \infty$, $t > 0$ subjected to

(*i*) $u(0, t) = 0$, $t > 0$

(*ii*) $u(x, 0) = e^{-2x}$, $x > 0$

(*iii*) u and $\frac{\partial u}{\partial x} \to 0$ as $x \to \infty$ [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[4757]-1062

S.E. (Chemical) (First Semester) EXAMINATION, 2015
CHEMISTRY-I
(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Question Nos. **1** *or* **2**, **3** *or* **4**, **5** *or* **6**, **7** *or* **8** from the following.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data if necessary.

1. (*a*) Draw and describe molecular orbital diagram and find the bond order for Nitrogen molecule. [4]

(*b*) Explain the structure and stability of free radicals. [4]

(*c*) Derive the integrated rate expression for second order kinetics involving two reactant with the same initial concentration. [4]

Or

2. (*a*) Name the various types of organic reaction. Explain substitution reaction with an example. [4]

(*b*) Derive the Arrhenius equation and show how it is calculated graphically. [4]

(*c*) Show that time required for a first order reaction to complete 99.9% reaction is approximately 10 times its half life period. [4]

3. (*a*) Explain the principle, technique and application of column chromatography. [4]

(*b*) State Lambert and Beer law. Derive the combined law equation. [4]

(*c*) Derive the thermodynamic equation relating T_b and H_{vap}. [5]

P.T.O.

Or

4. (*a*) Explain the instrumentation involved in UV-visible spectroscopy. [5]

(*b*) Derive the equation relating molar mass of solute with lowering of vapour pressure of its solution. [4]

(*c*) 2.43 gm sulphur in 100 gm naphthalene (MP = 80.1°C) has freezing point depression of 0.64°C. Latent heat of fusion of naphthalene is 19.4 J/mole. Find the molar mass and formula of sulphur in solution. (At. wt. of S = 32). [4]

5. (*a*) Explain, why phenol undergoes nitration faster than nitrobenzene. [4]

(*b*) Give the mechanism of Friedel-Craft's acylation and state the limitation. [4]

(*c*) Write a short note on Claisen rearrangement. [4]

Or

6. (*a*) Explain ethyl iodide gives ethylene by alcoholic KOH while it gives ethyl alcohol by action of aq. KOH. [4]

(*b*) Discuss the mechanism of E_1 and E_2 reaction of alkyl halides. [4]

(*c*) Write a short note on Beckmann's rearrangement. [4]

7. (*a*) Give the preparation of the following dyes : [5]

(*i*) Phenolphthalein

(*ii*) Methyl orange.

(*b*) Explain furan is more reactive than benzene in electrophilic substitution. [4]

(*c*) Describe the classification of dyes on the basis of chemical structure. [4]

Or

8. (*a*) Explain electrophilic substitution in five membered heterocycles. [5]

(*b*) Write a short note on diazotization and diazocoupling. [4]

(*c*) Give the steps involved in preparation of Alizarin. [4]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1063

S.E. (Chem.) (First Semester) EXAMINATION, 2015

CHEMICAL ENGINEERING FLUID MECHANICS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) *All* questions are compulsory.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) What is rheology ? How fluids are classified according to their rheological behaviour ? [6]

(*b*) Determine the viscosity of a liquid having kinematic viscosity 6 stokes and specific gravity 1.9. [6]

Or

2. (*a*) Write a short note on types of flow. [6]

(*b*) Explain with neat sketch the working of an inclined tube manometer. [6]

P.T.O.

3. (*a*) Derive the expressions for laminar flow of fluids $f = 16/NRe$. [6]

(*b*) Water is flowing at a rate of $5m^3/hr$. through 40 mm pipe. Find Reynolds' number and friction factor. Take density and viscosity of water at 1 gm/cc and 1 centipoise. Also determine the nature of flow. [6]

Or

4. (*a*) Derive Hagen-Poiseuille equation and highlighting the assumption made. [6]

(*b*) Draw a neat sketch and explain the working of venturimeter. [6]

5. (*a*) Explain growth of boundary layer on a flat plate. [5]

(*b*) Define and derive expression for momentum thickness. [8]

Or

6. (*a*) With suitable example, describe in detail the method of dimensional analysis using Buckingham's π theorem. [8]

(*b*) Derive an expression of displacement thickness. [5]

7. (*a*) Explain different types of fluidization. [8]

(*b*) Explain phenomenon of cavitation in pumps. How can it be prevented ? [5]

Or

8. (*a*) Explain any *one* :

(*i*) Major and minor losses during transportation of fluid through pipes. [5]

(*ii*) Types of valves with its applications.

(*b*) Write short notes on : [8]

(*i*) Surface or friction drag

(*ii*) Deformation drag

(*iii*) Pressure drag

(*iv*) Form drag.

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1064

S.E. (Chemical) (First Semester) EXAMINATION, 2015

CHEMICAL ENGINEERING MATERIALS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Define material and explain the classification of materials. [6]

(*b*) Explain any *two* types of non-destructive testing methods for materials. [6]

Or

2. (*a*) Explain in brief Imperfections in crystal structures. [6]

(*b*) Give the classification of engineering materials. [3]

(*c*) Explain about ASTM methods. [3]

P.T.O.

3. (*a*) Write short notes on the following : [8]

(*i*) Rolling

(*ii*) Bending

(*iii*) Central punching

(*iv*) Welding.

(*b*) Define Nanotechnology. State the applications of Nanomaterials in chemical industry. [5]

Or

4. (*a*) Write short notes on : [7]

(*i*) Carbon Nanotubes

(*ii*) Fullerites.

(*b*) Write short notes on : [6]

(*i*) Special steels

(*ii*) Aluminium alloys.

5. Write short notes on : [12]

(*a*) Atomic force microscopy

(*b*) Scanning tunneling microscopy.

Or

6. Explain principle and working of Scanning Electron Microscope (SEM). [12]

7. Write short notes on (any *four*) : [13]

(*i*) Clays

(*ii*) Cement

(*iii*) Glass

(*iv*) Refractories

(*v*) Glass vitreous silica

(*vi*) Borosilicates.

Or

8. (*a*) Write a short note on Organic Protective coatings. [6]

(*b*) Discuss in detail applications of Ceramic materials. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-1065

S.E. (Chemical) (First Semester) EXAMINATION, 2015

PROCESS CALCULATIONS

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) The solubility of methyl bromide (CH_3Br) in methanol is 44 kg per 100 kg methanol. Express the composition of the saturated solution in weight % and mole %. (Atomic weight of Br = 79.91). [4]

P.T.O.

(*b*) A waste acid from a nitrating process contains 23% HNO_3, 57% H_2SO_4 and 20% water by weight. This acid is concentrated to a mixture containing 27% HNO_3, 60% H_2SO_4 and 13% water by using sulphuric acid containing 93% H_2SO_4 and nitric acid containing 90% NHO_3. Calculate the amount of waste acid and concentrated acids to get 100 kg of desired mixed acid. [8]

Or

2. (*a*) A gas mixture of CH_4 and C_2H_6 has an average molecular weight of 22.4. Find the partial pressure of CH_4 if the total pressure is atmospheric. [4]

(*b*) A mixture of $CuSO_4.5H_2O$ and $FeSO_4.7H_2O$ weighs 100 g. After removing the water of hydration by heating the dehydrated mass weighs 60 g. Calculate the weight ratio of $CuSO_4.5H_2O$ to $FeSO_4.7H_2O$ in the original salt mixture. (Atomic weights : Cu = 63, S = 32, Fe = 56). [8]

3. (*a*) A gaseous reaction $A \rightarrow 2B + C$ takes place in an isothermal constant pressure reactor. Starting with a mixture of 60% A and 40% inerts (by volume) in a specified time the volume doubles. Calculate the conversion achieved. [6]

(*b*) Liquid benzene at 303 K is continuously mixed with liquid toluene at 373 K in a molar proportion of 3 : 2 in an insulated tank. If the heat of mixing is assumed to be zero what is the temperature of the final mixture. Heat capacity data for benzene and toluene is as follows (assume $c = a + bT$) : [7]

Temp. K	**Heat Capacity (c) kJ/kg K**	
	Benzene	**Toluene**
283	1.591	1.524
338	2.018	—
358	—	2.236

Or

4. (*a*) Orthoxylene on oxidation gives phthalic anhydride. The reaction taking place is : $C_8H_{10} + 3O_2 \rightarrow C_8H_{10}O_3 + 3H_2O$. 20% excess air is used. The conversion is 50% and the yield of phthalic anhydride is 80% Calculate the requirement of orthoxylene and air for 100 kmol of phthalic anhydride. [6]

(*b*) Chlorinated diphenyl is heated from 313 K to 553 K at the rate of 4000 kg/h. Its heat capacity is given by $c = 0.7511 + 1.465 \times 10^{-3}$ T kJ/kg K. Also the mean heat capacity values at 313 K and 553 K are 1.1807 and 1.5198 kJ/kg K respectively. Calculate the heat to be supplied using both the data and find the percentage error when mean values of heat capacity are used. [7]

5. (*a*) Liquid paraffin wax is crystallized in a continuous jacketed crystallizer. For a particular run the data is as follows : Liquid paraffin fed = 675 kg/h, inlet temperature = 332 K, outlet temperature = 320 K, Mean heat capacity = 2.93 kJ/kg K, Latent heat of crystallization = 168.7 kJ/kg, Crystallization temperature = 320 K, Power input at shaft = 17 kW, Cooling water flow in the jacket = 1.92 lps, rise in jacket water temperature = 5.8 K. Assuming no radiation losses calculate the mass flowrate of crystals and the percentage crystallization. [8]

(*b*) Define relative humidity and percentage humidity, and derive a relation between them. [5]

Or

6. (*a*) Carbon dioxide contains 0.053 kmol water vapour per kmol of dry CO_2. Temperature of the gas is 308 K and the pressure is 100 kPa. Calculate the relative saturation of the mixture, percentage saturation and the temperature upto which the mixture must be heated in order to achieve a relative saturation of 30%. Vapour pressure of water 308 K = 5.6 kPa and at 330 K = 16.475 kPa. [8]

(*b*) Define wet bulb and dry bulb temperature, humid volume and humid heat. [5]

7. (*a*) Fuel gas has the following composition : CO = 27%, CO_2 = 4%, O_2 = 0.5% and N_2 = 68.5% by volume. Find the net theoretical oxygen required. Find the analysis of flue gas if the fuel gas is burned with 80% excess air than the net requirement. [7]

(*b*) Explain in detail about proximate analysis of coal. [5]

Or

8. (*a*) The burning of a fuel oil which does not have nitrogen gives the following composition of the flue gas by volume : CO_2 = 11.6%, O_2 = 5% and N_2 = 83.4% on dry basis. Compute the percentage excess air used and the carbon to hydrogen weight ratio in the fuel. [7]

(*b*) Define adiabatic flame temperature and HCV and NCV. Is the actual adiabatic flame temperature different than that calculated theoretically ? [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1066

S.E. (Chemical) (Second Semester) EXAMINATION, 2015

CHEMISTRY—II

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer *four* questions.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Give evidence against the open chain structure of glucose. [4]

(*b*) What is a Zwitter ion ? Describe the isoelectric point. [4]

(*c*) Explain giving reason, why all transition metals exhibit variable oxidation states. [4]

Or

2. (*a*) Draw structures of Amylase, Amylopectin and Cellulose. [4]

(*b*) Explain the non-existence of low spin tetrahedral complex. [4]

(*c*) Draw and describe the diagram showing splitting of *d*-orbitals for transition metal ion in octahedral field. [4]

P.T.O.

3. (*a*) (*i*) 25 ml of standard solution of 0.05 M KCl solution takes 37.5 ml of $AgNO_3$ from burette, during standardization of the $AgNO_3$, by Mohr's method.

(*ii*) 100 ml of chloride water sample requires 11.7 ml of the $AgNO_3$ solution. Calculate the quantity of chloride ions per litre in the given water sample. [4]

(*b*) Explain strong acid-strong base titration with titration curve. [4]

(*c*) Give mechanism of metal co-ordination compound catalysed reactions in Wacker process. [4]

Or

4. (*a*) What is a complexometric titration ? Explain any *one*. [4]

(*b*) Derive the Langmuir adsorption isotherm. [4]

(*c*) Explain "Adsorption theory" of catalysis. [4]

5. (*a*) What do you understand by the term conformations ? Draw all conformations of ethane. [5]

(*b*) Explain geometrical isomerism with a suitable example. [4]

(*c*) Assign R and S configuration in 2, 3-dichloropentane. [4]

Or

6. (*a*) Discuss the conformations of cyclohexane with the help of energy profile diagram. [5]

(*b*) Explain Bayer's strain theory for cycloalkanes. [4]

(*c*) Define the terms enantiomers and diastereomers giving examples. [4]

7. (*a*) Give the mechanism and kinetics involved in nitration of various organic compounds. [5]

(*b*) Give the details of process for manufacture of Dodecylbenzene sulphonate. [4]

(*c*) Give the various reagents used for Halogenation. [4]

Or

8. (*a*) Write a note on design of reactors. [5]

(*b*) Explain continuous nitration process. [4]

(*c*) Give the mechanism of sulphonation. [4]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1067

S.E. (Chemical Engineering) (Second Semester)

EXAMINATION, 2015

CHEMICAL ENGINEERING THERMODYNAMICS—I

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right side indicate full marks.

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Explain PV diagram for a pure substance showing all the regions. [6]

(*b*) Calculate the molar volume and compressibility factor for methanol vapor at 500 K and 10 bar by using Redlich-Kwong equation. Constants for Redlich-Kwong equation :

$a = 21.7181\ \text{Nm}^4\text{K}^{1/2}/\text{mol}^2$, $b = 4.5617\ \text{m}^3/\text{mol}$. [6]

P.T.O.

Or

2. (*a*) Explain the phase rule and discuss the degree of the freedom for any system. [4]

(*b*) Derive the expression for work done and heat transferred for a polytropic process. [8]

3. (*a*) Derive the expression to show temperature dependence of standard heat of reaction. [6]

(*b*) Derive the following relation for the efficiency of Carnot engine : [7]

$$\eta = (T_h - T_1)/T_h.$$

Or

4. (*a*) Pure CO is mixed with 100% excess air and completely burnt at constant pressure. The reactants are originally at 400 K. Determine the heat added or removed if the products leave at 600 K. The standard heat of reaction at 298 K is –283.028 kJ per mol CO burned. The mean specific heats applicable in the temperature range of this problem are 29.10, 29.70, 29.10 and 41.45 J/mol K respectively for CO, O_2, N_2 and CO_2. [7]

(*b*) Explain the concept of entropy and prove that entropy is a state function. [6]

5. (*a*) The equation of state of a certain substance is given by the expression :

$$V = RT/P - C/T^3 \text{ and } C_P = A + BT,$$

where A, B and C are constants. Derive expression for changes in internal energy, enthalpy and entropy for :

(*i*) An isothermal process

(*ii*) An isobaric process. [8]

(*b*) Explain the terms coefficient of volume expansion and isothermal compressibility. [5]

Or

6. (*a*) Derive the following fundamental residual property relation for 1 mol of substance for closed thermodynamic system :

$$d(G^R/RT) = V^R\ dP/(RT) - H^R\ dT/(RT^2)$$

where, G^R-residual Gibbs free energy; V^R-residual volume; H^R-residual enthalpy; T-temperature; P-pressure and R-Universal gas constant. [8]

(*b*) Derive the Clausius-Clapeyron equation for vapor-liquid two phase system. [5]

7. (*a*) Differentiate between a refrigerator and a heat pump. [4]

(*b*) The work output from a Carnot engine operating between two thermal reservoirs at 500 K and 900 K respectively is utilised by a Carnot refrigeration machine for absorbing

heat at the rate of 4 kJ/s from a cold room at 270 K and discarding heat to the surrounding at 300 K. Determine the quantity of heat absorbed by the engine at 600 K. If the COP of the refrigerator and the efficiency of the engine are two third of the ideal values, what is the quantity of heat absorbed by the engine at 500 K. [8]

Or

8. (*a*) Why is liquefaction of gass needed ? [3]

(*b*) A Carnot engine is coupled to a Carnot refrigerator so that all the work produced by the engine is produced by the engine is used by the refrigerator in extraction of heat from a heat reservoir at 0°C at the rate of 35 kW. The source of energy for the Carnot engine is a heat reservoir at 250°C. If both devices discard heat to the surroundings at 25°C, how much heat does the engine absorb from its heat-source reservoir ? If the actual coefficient of performance of the refrigerator is $COP_{actual} = 0.6\ COP_{Carnot}$ and if the thermal efficiency of the engine is $\eta_{actual} = 0.6\ \eta_{Carnot}$, how much heat does the engine absorb from its heat source reservoir ? [9]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1068

S.E. (Chemical) (Second Semester) EXAMINATION, 2015

HEAT TRANSFER

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Assume suitable data, if necessary.

(*iii*) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.

1. (*a*) Explain different modes of Heat Transfer with their fundamental Laws. [6]

(*b*) Explain Rayleigh's method of dimensional analysis. [6]

Or

2. (*a*) State and explain : [6]

(*i*) Fourier law of heat conduction

(*ii*) Newton's law of cooling

(*iii*) Stefan-Boltzmann's law of radiation.

(*b*) Thermal conductivity of a material at any temperature is given by equation, K = 0.925 + 0.000486 T(W/mK). If the plane wall of thickness 25 cm is constructed using this material and the two sides are maintained at 1200°C and 450°C respectively. Calculate the heat flow rate per unit area. [6]

P.T.O.

3. (*a*) Explain the Radiation shield. [3]

(*b*) Define : [3]

(*i*) Emissive power

(*ii*) Radiosity

(*iii*) Irradiation.

(*c*) Two large parallel plates with emissivities 0.2 and 0.6 are maintained at 1000 K and 500 K respectively. A third plate with emissivity 0.08 is introduced as a radiation shield in between two plates. Calculate reduction in heat loss rate per unit area and temperature of the shield ? [6]

Or

4. (*a*) Explain any *two* : [6]

(*i*) Radiation shape factor

(*ii*) Kirchoff's identity

(*iii*) Concept of Black Body.

(*b*) Derive the following relationship for forced convection heat transfer process by dimensional analysis : [6]

$Nu = C\ [Re^a.Pr^b]$

where,

Nu = Nusselt number

Re = Reynolds' number

Pr = Prandtl number

a, b and c are numerical constants.

5. (a) A shell and tube heat exchanger is to be provided with tubes of 31 mm outer diameter and 27 mm inner diameter, 4 m long. It is required for heating water from 295 K to 318 K with the help of condensing steam at 393 K on the outside of tubes. Determine the number of tubes required if water flow rate is 10 kg/sec. Heat transfer coefficient on steam side and water side are 6000 W/m^2 K and 850 W m^2 K respectively. Neglect all other resistances. [8]

(b) What is Heat Exchangers ? Enlist the types of Heat Exchangers. [5]

Or

6. (a) Describe Fouling factor in heat exchanger. [4]

(b) Explain individual and overall heat transfer coefficient. [4]

(c) Derive Log Mean Temperature Difference (LMTD) for concurrent double pipe heat exchanger. [5]

7. (*a*) Differentiate between the single effect and multiple effect evaporators. [6]

(*b*) An aqueous sodium chloride solution (10 wt %) is fed into a single effect evaporator at a rate of 10000 kg/hr. It is concentrated to a 20 wt % sodium chloride solution. The rate of consumption of steam in the evaporator is 8000 kg/hr. Calculate capacity (kg/hr) and economy of the evaporator. [7]

Or

8. (*a*) What is an evaporation ? Explain Calendria type evaporator with neat sketch. [8]

(*b*) Define Boiling point elevation and explain Duhring's plot. [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-1069

S.E. (Chem.) Second Sem.) EXAMINATION, 2015

PRINCIPLES OF DESIGN

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*iv*) Assume suitable data, if necessary.

1. (*a*) A metal rod of 16 mm diameter is fractured at a tensile force of 90 kN. Another hollow circular rod of 25 mm inside diameter of same metal has to withstand a tensile force of 40 kN. Adopting a factor of safety 3, determine the required wall thickness. [6]

(*b*) Draw stress strain diagram for cast iron and explain in detail. [6]

P.T.O.

Or

2. (*a*) What is meant by 'stress concentration' ? How do you take it into consideration in case of a component subjected to dynamic loading ? [6]

(*b*) A square pin is required to resist a pull of 40 kN and a shear force of 15 kN. Determine suitable section according to strain energy theory. The material of the pin has elastic limit 350 MPa and μ = 0.3. Take F.O.S. = 2.5. [6]

3. (*a*) Design a muff coupling used to connect two shafts transmitting 95 kW at 400 rpm. The material of the shaft and key is plain carbon steel for which allowable shear and crushing stresses are 40 MPa and 80 MPa respectively. The material for the muff is cast iron which has permissible shear stress 15 MPa. Also check safety of the design in shear and crushing. Assume that $T_{max} = 1.25\ T_{avg}$. [8]

(*b*) A line shaft is given to transmit it 100 kW at 300 rpm by means of a motor placed vertically below it. The pulley is overhang from the shaft at 400 mm from the bearing as shown in Fig. 1. The pulley is 1 m in diameter and has belt tensions

in the ratio 2 : 1. Find the diameter of the shaft if maximum allowable shear stress is 40 MPa. [6]

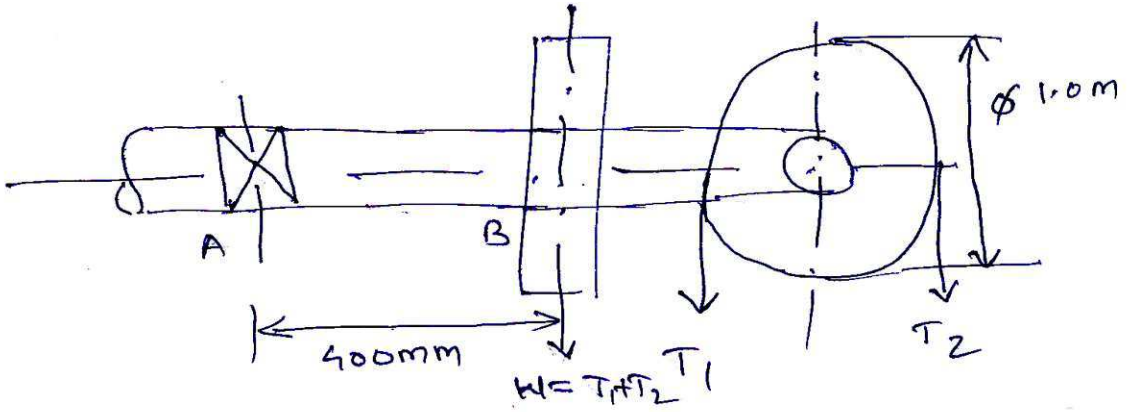


Fig. 1

Or

4. (*a*) Draw S.F. and B.M.D. for the simply supported beam shown in Fig. 2. Find maximum B.M. values along with their positions on the beam. Find point of contraflexure if any. [8]

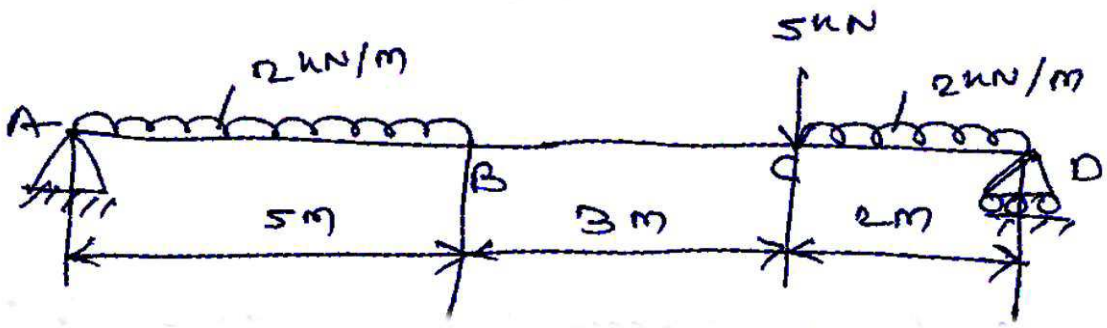


Fig. 2

(*b*) An automobile transmission shaft is required to transfer 45 kW at 500 rpm. The outside diameter must not exceed 50 mm and the maximum shear stress is not to exceed 84 MPa. Compare the weights of solid and hollow shafts which would just meet these requirements. Also find percentage saving in material if any. [6]

5. (*a*) What are various types of welding joints used in pressure vessels ? Discuss with neat sketches. [6]

(*b*) A leather belt weighing 2 kg/m is used to drive a cast iron pulley 800 mm in diameter at 300 r.p.m. if the angle of contact of the belt is spread over $\frac{5}{1.2}$ of the circumference and maximum tension in belt is 4000 N, find power capacity of the belt :

(*i*) considering the centrifugal tension and

(*ii*) without considering centrifugal tension.

The coefficient of friction of leather on cast iron is 0.35. [6]

Or

6. (*a*) A 100 mm long journal bearing supports a load of 3 kN on a 60 mm diameter shaft. The bearing has diametral clearance of 0.1 mm and the viscosity of the oil is 0.02 kg/m-s at the operating temperature. If the bearing can dissipate heat of 100 J/s, determine the maximum safe speed. Assume, $k = 0.002$. [6]

(*b*) With neat sketches explain types of flanged joints used in pressure vessels. [6]

7. (*a*) A cylindrical shell of a vessel has an inside diameter 2 m and is subjected to an internal pressure 5 kg/cm^2. Calculate the required thickness and corresponding deflection. Allowable tensile stress of the material is 1020 kg/cm^2. [6]

(*b*) Which joint in a vessel is stronger, circumferential or longitudinal ? How can the weak joint be reinforced ? What are the advantages of such reinforcement ? [6]

Or

8. (*a*) Calculate the thickness of a flanged torispherical head for a vessel having internal diameter 6000 mm. Design pressure of the vessel is 3.4 kg/cm^2. Inside crown radius is 6000 mm. Inside knuckle radius is 380 mm. Permissible stress of the material is 1190 kg/cm^2, welded joint efficiency is 100%. [6]

(*b*) A vessel is designed for an internal pressure 100 kg/cm^2. A spiral wound metal fibre stainless steel gasket with inside diameter 36 cm and width 2.0 cm is used. Gasket factor is 3.0 while gasket seating stress is 675 kg/cm^2.

Permissible stress for bolt material at atmospheric and operating condition is 1300 kg/cm^2. Check whether the gasket width is sufficient to keep it away from crushing out ? [6]

Total No. of Questions—**9**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-107

S.E. (Civil) (Second Semester) EXAMINATION, 2015

BUILDING PLANNING

(2008 PATTERN)

Time : Four Hours **Maximum Marks : 100**

N.B. **:—** (*i*) *All* questions are complsory.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Draw neat sketches wherever necessary.

(*iv*) Section two should be drawn on drawing sheet only.

(*v*) Figures to the right indicate full marks.

(*vi*) There will be no internal option for questions in Section II.

(*vii*) Assume suitable data, if necessary.

SECTION I

1. (*a*) State different objectives of DP and parameters of quality of urban life. [8]

(*b*) Explain the importance of orientation of building with respect to cardinal direction. [4]

(*c*) Enlist the documents to be submitted along with the building plans. [4]

P.T.O.

Or

2. (*a*) Explain the utility of 6-D form, 7/12 form. [8]

(*b*) Explain the role of Plan Sanctioning Authority for township. [4]

(*c*) What are the different methods opted for Rain water harvesting ? Explain any *one* in detail. [4]

3. (*a*) Explain with sketches wind effects and stack effects. [9]

(*b*) Explain the following terms with sketches : [9]

(*i*) Building line

(*ii*) Control line

(*iii*) Marginal distance.

Or

4. (*a*) State the byelaws regarding road width and height of the building. [6]

(*b*) What do you understand by artificial elimination and quality of air ? [6]

(*c*) Write short notes on : [6]

(*i*) Natural Ventilation

(*ii*) Artificial Lighting.

5. (*a*) Explain in detail any *two* constructional measures for noise control. [6]

(*b*) What factors influence fire development in a building ? [4]

(*c*) Write short notes on septic tank with soak pit. [6]

Or

6. (*a*) Explain : [6]

(*i*) Sabine's formula

(*ii*) Sound foci and Dead spots.

(*b*) Explain one-pipe and two-pipe plumbing system. [6]

(*c*) What factors affect designing and planning of electrical services ? [4]

SECTION II

7. A line plan for a residential building is shown in Fig. 1. Use the following data :

(*a*) All external walls are of 230 thick

(*b*) All partition walls are of 115 thick

(*c*) RCC frame structure

(*d*) Beam sizes = 230 × 450

(*e*) Column sizes = 230 × 450

(*f*) Floor to floor height = 3150

(*g*) Plinth height = 450

(*h*) Depth of foundation = 1500

(*i*) Trade = 250

(*j*) All dimensions are in mm.

(*i*) Draw to scale 1 : 50 detailed plan [8]

(*ii*) Draw to scale 1 : 50 detailed section XX [8]

(*iii*) Write schedule of openings [2]

(*iv*) Calculate A and B dimensions. [2]

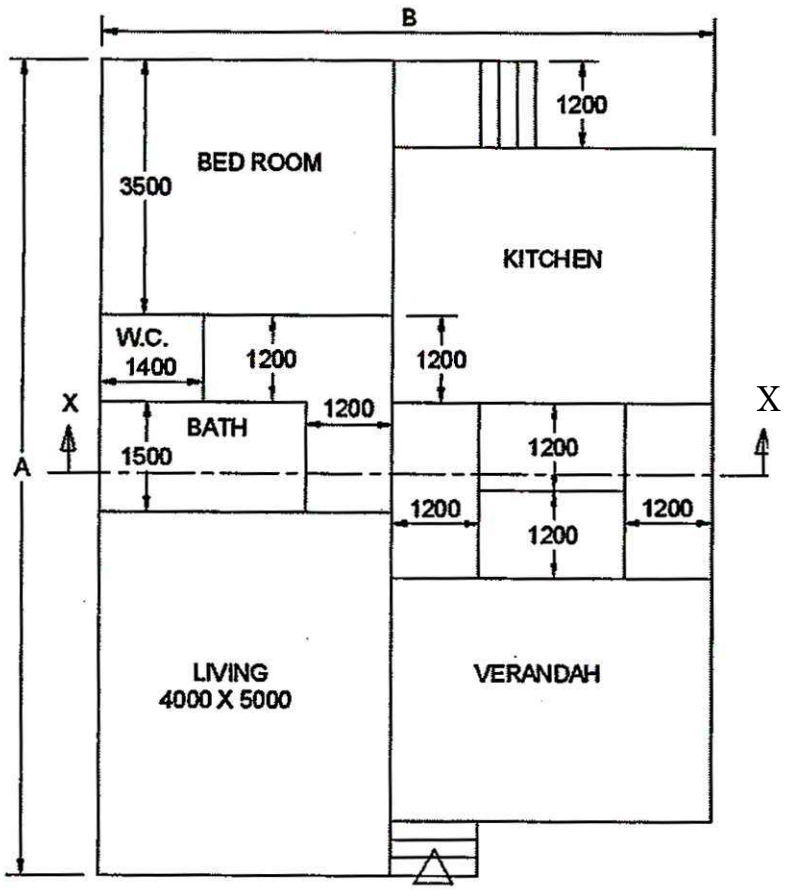


Fig. 1 : Plan

8. It is proposed to construct a library building in an engineering college with the following units : [15]

(*i*) Entrance/Entrance Lobby

(*ii*) Issue counters + other related activities

(*iii*) Reference section

(*iv*) Journal/magazine/newspaper section

(*v*) Reading Hall—capacity 50-60 students

(*vi*) Electronics learning room with computer (10 Nos.) and facilities like T.V., Internet, etc.

(*vii*) Seminar room/Discussion room—capacity 25 students

(*viii*) Space/Shelves for stacking books—80 sq. m.

(*ix*) Cabins for librarian/Asst. librarian/clerk

(*x*) Toilets for gents, ladies, wash basin, drinking water fountain

(*xi*) Assume any other data required.

Draw a line plan showing the arrangements of all units and indicate location of doors and windows.

9. Draw to a scale of 1 : 50 or suitable a two point perspective of the building shown in Fig. 2 : [15]

(*i*) Eye level at human height

(*ii*) D = 1000 × 2100, W = 600 × 1000

(*iii*) All dimensions are in mm

(*iv*) Station point at 12000 mm away from picture plane vertically below the corner of the building touching the picture plane.

(*v*) Retain all construction lines.

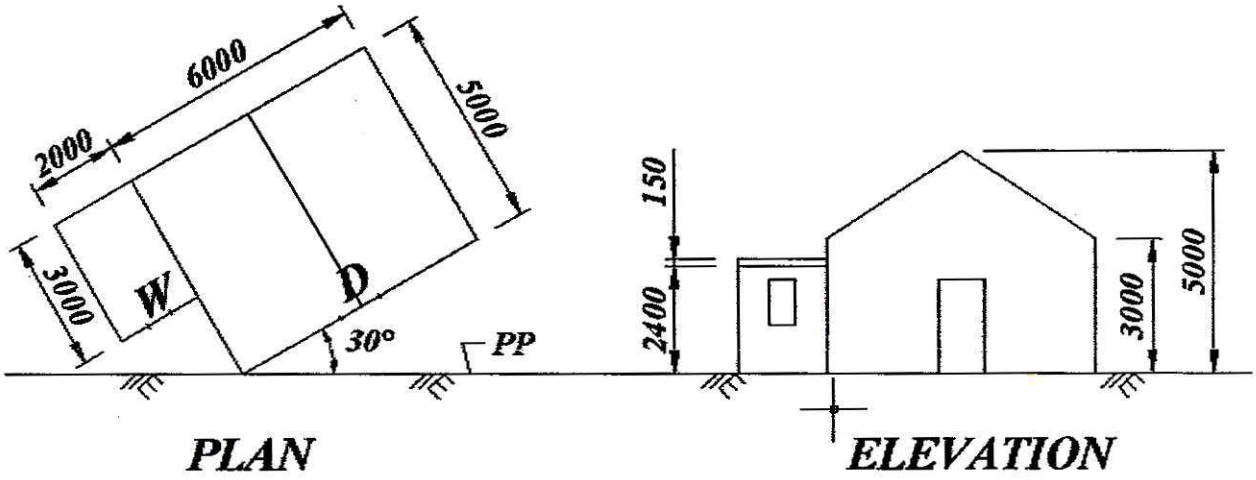


Fig. 2

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1070

S.E. (Chemical) (Second Semester) EXAMINATION, 2015

MECHANICAL OPERATIONS

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** and Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Explain Cyclone Separator with neat diagram. [6]

(*b*) What is screen efficiency and screen effectiveness ? [6]

Or

2. (*a*) A material is crushed in a Blake Jaw Crusher such that the average size of particles is reduced from 50 mm to 10 mm with the consumption of energy of 13.0 kW(kg/s). What would be the

P.T.O.

consumption of energy needed to crush the same material of average particle size 75 mm to an average size of 25 mm :

(*i*) Assuming Rittinger's law applies

(*ii*) Assuming Kick's law applies.

Which of these results would be regarded as being more realistic and why ? [8]

(*b*) Explain the importance of screening in Chemical Industry. [4]

3. (*a*) Describe with a neat sketch the construction of Belt Conveyor. [6]

(*b*) Describe with a neat sketch the construction of Screw Conveyor. [6]

Or

4. (*a*) Describe with neat sketch construction of screw conveyor. List advantages and disadvantages. [6]

(*b*) Write short notes on : [6]

(*i*) Sigma Mixer

(*ii*) Ribbon Blender.

5. (*a*) Describe with a neat sketch the working of plate and frame filter press. [8]

(*b*) Explain the operating cycle of centrifuge filter. [5]

Or

6. (*a*) A rotary filter operating at 2 rpm, filters 1000 lit/min. operating under the same vacuum neglecting the resistance of the filtercloth, at what speed must the filter be operated to give afiltration rate of 2000 lit/min. [9]

(*b*) Write a note on Bag Filters. [4]

7. (*a*) Calculate the settling velocity of glass spheres having a diameter of 1.554×10^{-4} m in water at 293.2 K. The slurry contains 60 wt% solid. The density of the glass spheres is 2467 kg/m^3, density of water 998 kg/m^3 and viscosity of water is 1.005×10^{-3} Pa.s [9]

(*b*) Write a note on Particulate fluidization. [4]

Or

8. (*a*) Write an explanatory note on Kych Theory of Sedimentation. [9]

(*b*) Distinguish between free settling and hindered settling. [4]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1071

S.E. (Computer Engineering/Information Technology)
(Second Semester) EXAMINATION, 2015
ENGINEERING MATHEMATICS–III
(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Attempt *four* questions : Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.
(*ii*) Neat diagrams must be drawn wherever necessary.
(*iii*) Figures to the right indicate full marks.
(*iv*) Use of electronic non-programmble calculator is allowed.
(*v*) Assume suitable data if necessary.

1. (*a*) Solve (any *two*) : [8]

(*i*) $(D^2 + 9)y = x^3 - \cos 3x$

(*ii*) $(D^2 + 2D + 1)y = e^{-x} \log x$

(*iii*) $(2x+1)^2 \frac{d^2y}{dx^2} - 6(2x+1)\frac{dy}{dx} + 16y = 8(2x+1)^2$.

(*b*) Find Fourier sine transform of $f(x) = e^{-x} \cos x$, $x > 0$. [4]

Or

2. (*a*) A resistance of 50 ohms, an inductor of 2 henries and a 0.005 farad capacitor are connected in series with e.m.f. of 40 volts and an open switch. Find the instanteneous charge and current after the switch is closed at $t = 0$, assuming that at that time charge on capacitor is 4 coulomb. [4]

P.T.O.

(*b*) Solve (any *one*) : [4]

(*i*) Find z-transform of $f(k) = \frac{\sin ak}{k}$, $k > 0$.

(*ii*) Find inverse z-transform of $\frac{3z^2 + 2z}{z^2 + 3z + 2}$, $1 < |z| < 2$.

(*c*) Solve difference equation : [4]

$f(k + 2) - 3f(k + 1) + 2f(k) = 0$, $f(0) = 0$, $f(1) = 1$.

3. (*a*) The first four monents of a distribution about the value 5 are 2, 20, 40 and 50. Obtain the first four central moments, mean, standard deviation and coefficient of skewness and kurtosis. [4]

(*b*) A manufacturer of electronic goods has 4% of his product defective. He sells the articles in packets of 300 and guarantees 90% good quality. Determine the probability that a particular packet will violate the guarantee. [4]

(*c*) Find the directional derivative of $xy^2 + yz^3$ at (2, –1, 1) along the line $2(x - 2) = (y + 1) = (z - 1)$. [4]

Or

4. (*a*) In an intelligence test administered to 1000 students the average score was 42 and standard deviation 24. Find the number of students with score lying between 30 and 54.

(Given : For $z = 0.5$, area = 0.1915). [4]

(*b*) Prove (any *one*) : [4]

(*i*) $\nabla^2 \left(\frac{\bar{a} \cdot \bar{b}}{r} \right) = 0$

(*ii*) $\nabla \times \left(\frac{\bar{a} \times \bar{r}}{r} \right) = \frac{\bar{a}}{r} + \frac{(\bar{a} \cdot \bar{r})\bar{r}}{r^3}$.

(*c*) Show that $\bar{F} = r^2\bar{r}$ is conservative. Obtain the scalar potential associated with it. [4]

5. (*a*) Evaluate : [4]

$$\int_C \bar{F} \cdot d\bar{r}$$

where $\bar{F} = (2x + y^2)\bar{i} + (3y - 4x)\bar{j}$ and

C is the parabolic arc $y = x^2$ joining (0, 0) and (1, 1).

(*b*) Using Stokes theorem, evaluate : [5]

$$\int_C (x + y)dx + (2x - z)dy + (y + z)dz$$

where C is the curve given by
$x^2 + y^2 + z^2 - 2ax - 2ay = 0,\ x + y = 2a.$

(*c*) Use divergence theorem to evaluate :

$$\iint_S (x\bar{i} - 2y^2\bar{j} + z^2\bar{k}) \cdot d\bar{s}$$

where *s* is the surface bounded by the region $x^2 + y^2 = 1$ and $z = 0$ and $z = 1$. [4]

Or

6. (*a*) Apply Green's theorem to evaluate :

$$\int_C (2x^2 - y^2)dx + (x^2 + y^2)dy$$

where C is the boundary of the area enclosed by the *x*-axis and the upper-half of the circle $x^2 + y^2 = 16$. [4]

(*b*) Using Stokes theorem, evaluate

$$\iint_S (\nabla \times \bar{F}) \cdot d\bar{s}$$

where $\bar{F} = 3y\bar{i} - xz\bar{j} + yz^2\bar{k}$ and '*s*' is the surface of the paraboloid $2z = x^2 + y^2$ bounded by $z = 2$. [5]

(*c*) Show that : [4]

$$\iiint_V \frac{2}{r} dv = \iint_S \frac{\bar{r} \cdot \hat{n}}{r} ds .$$

7. (*a*) Find the imaginary part of the analytic function whose real part is $x^3 - 3xy^2 + 3x^2 - 3y^2$. [4]

(*b*) Evalaute :

$$\oint_C \frac{z^2 + 1}{z^2 - 1} dz$$

where C is the circle : [4]

$$|z - 1| = 1.$$

(*c*) Find the bilinear transformation, which maps the points

$z = -1, 0, 1$

on to the points

$w = 0, i, 3i$

respectively. [5]

Or

8. (*a*) Show that analytic function $f(z)$ with constant amplitude is constant. [4]

(*b*) Evaluate the following integral using residue theorem :

$$\oint_C \frac{4 - 3z}{z(z - 1)(z - 2)} dz$$

where C is the circle :

$$|z| = \frac{3}{2}.$$ [4]

(*c*) Find the image of the straight line $y = 3x$ under the transformation

$$w = \frac{z - 1}{z + 1}.$$ [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1072

S.E. (Computer) (First Semester) EXAMINATION, 2015

DATA STRUCTURES AND PROBLEM SOLVING

(2012 COURSE)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right side indicate full marks.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Write a pseudo 'C' code to implement quick sort. Derive time complexity of quick sort in best and worst case. [6]

(*b*) Derive the code for the following message using Huffman encoding 'A B R A K A D A B R A'. [6]

Or

2. (*a*) Sort the following data using merge sort : [3]

[10, 5, 15, 3, 20, 1, 30, 9].

(*b*) Write recursive function to calculate a^b. [3]

P.T.O.

(*c*) Create a binary tree from the following inorder and postorder traversals. Also write preorder traversal of the constructed tree : [3]

Postorder	**Inorder**
I	D
D	I
H	C
G	G
C	H
F	B
B	F
E	A
A	E

(*d*) What is binary tree ? How is it different from a basic tree ? Explain with figures. [3]

3. (*a*) Write algorithm for Breadth First Traversal of the graph. Also write its complexity. [6]

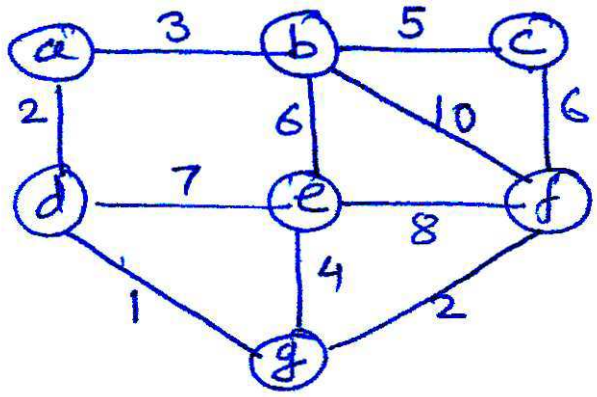
(*b*) Construct the AVL tree for the following data :

20, 1, 2, 25, 15, 70, 30, 75, 10, 35.

Show clearly rotation used. [6]

Or

4. (*a*) Find the shortest path from *a* to *f*, in the following graph using Dijkstra's Algorithm. [6]



(*b*) Write 'C' code for the following function w.r.t. AVL tree :

(*i*) Rotate Left

(*ii*) Rotate Right. [3]

(*c*) For the hash table size of 10 using hash function key F(key) = key % 10 insert the following keys :

65, 75, 25, 29, 85, 39, 36.

Use linear probing with chaining. [3]

5. (*a*) Sort the following data in descending order using heap sort

85, 15, 25, 95, 145, 55, 165, 75.

Show all steps. [5]

(*b*) Construct B+ tree of order 3 for the following data : [4]

10, 2, 30, 5, 90, 100, 50, 75, 35, 25.

(*c*) Write 'C' program to read 10 integers from keyboard and store them in the file "My File". [4]

Or

6. (*a*) Create Min Heap for the following data using repeated insertion method 5, 7, 2, 3, 9, 1, 10. [4]

(*b*) What is B tree ? Explain the procedure to delete node from B tree. [3]

(*c*) Explain random access file and sequential file. [3]

(*d*) Explain the following operation on sequential file :

(*i*) Creation

(*ii*) Read

(*iii*) Insert. [3]

7. (*a*) Find the largest number among the following using parallel computation : [6]

10, 3, 2, 8, 30.

(*b*) Write a parallel algorithm for odd even merge sort. [4]

(*c*) Explain in detail parallel computation model. [3]

Or

8. (*a*) Explain the list ranking problem. Explain with example how will you solve it using pointer jumping techniques. [6]

(*b*) Compute prefix sum (8, 2, –1, 5) using binary tree techniques. [4]

(*c*) Write notes on : [3]

(*i*) CRCW

(*ii*) EREW

(*iii*) CREW.

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1073

S.E. (Computer Engg.) (First Semester) EXAMINATION, 2015

DIGITAL ELECTRONICS AND LOGIC DESIGN

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4** and Q. No. **5** *or* Q. No. **6** and Q. No. **7** *or* Q. No. **8**.

(*ii*) Figures to the right indicate full marks.

(*iii*) Assume suitable data, if necessary.

1. (*a*) Minimize the following function using K-map and realize using logic gates : [4]

$$F(A, B, C, D) = \sum m\ (1, 5, 7, 13, 15) + d(0, 6, 12, 14)$$

(*b*) Convert the following : [2]

$$(46)_{10} = (?)_8$$

(*c*) List the differences between CMOS and TTL. [6]

P.T.O.

Or

2. (*a*) Convert the following numbers into binary numbers ? [4]

(*i*) $(37)_8$

(*ii*) $(25.5)_{10}$

(*b*) Explain standard TTL characteristics in detail. [6]

(*c*) Represent the following signed number in 2's complement method : [2]

(*i*) +25

(*ii*) –25

3. (*a*) Design a 3-bit excess 3 to 3-bit BCD code converter using logic gate. [6]

(*b*) Design mod-5 synchronous counter using J-K flip-flop. [4]

(*c*) Draw the excitation table of J-K flip-flop. [2]

Or

4. (*a*) Design a 4-bit binary to Gray code converter circuit using logic gates. [4]

(*b*) Design a Mod 20 counter using decade counter IC7490. [6]

(*c*) Perform the following : [2]

$(11011)_2 + (0101)_2 = (?)_2$

5. (*a*) State and explain basic component of ASM chart ? Also explain the salient features of ASM chart. [7]

(*b*) Write VHDL code 4 : 1 multiplexer using behavioural and data flow modelling style. [6]

Or

6. (*a*) Design a sequence generator circuit to generate the sequence 1–2–3–7–1 using Multiplexer controller based ASM approach. Consideration : [7]

(*i*) If control input C = 0, the sequence generator circuit in the same state.

(*ii*) If control input C = 1, the sequence generator circuit goes into next state.

(*b*) Explain the following statements used in VHDL with suitable examples : [6]

(*i*) CASE

(*ii*) With select-when

(*iii*) Loop statement.

7. (*a*) Comparison between PROM, PLA and PAL. [7]

(*b*) Draw and explain the basic architecture of FPGA. [6]

Or

8. (*a*) A combinational circuits is defined by the function : 7

$F_1(A, B, C) = \sum m\ (0, 1, 3, 7)$

$F_2(A, B, C) = \sum m\ (1, 2, 5, 6)$

Implement this circuit with PLA.

(*b*) A combinational circuits is defined by the function : 6

$F_1\ (A, B, C) = \sum m\ (0, 1, 5, 6, 7)$

Implement this circuit with PAL.

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1074

S.E. (Computer Engg.) (First Semester) EXAMINATION, 2015

OPERATING SYSTEM AND ADMINISTRATION

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Draw and explain high level architecture of unix systems. [6]

(*b*) Write a short note on interrupts and exceptions. [4]

(*c*) Explain batch processing and multiprogramming. [2]

Or

2. (*a*) Explain **4** state process diagram. [6]

(*b*) What do you mean by user and hardware perspective of operating system ? [4]

(*c*) List any *two* functions of an OS. [2]

P.T.O.

3. (*a*) Explain organization of the file hierarchy tree. [6]

(*b*) Explain types of files in unix. [3]

(*c*) Explain input, output and error redirection. [3]

Or

4. (*a*) Explain the entire process of booting (system turn on to login prompt). [6]

(*b*) Differentiate between grub and LILO. [4]

(*c*) Define a shell. [2]

5. (*a*) Which *two* signals can never be ignored ? [2]

(*b*) Explain signal and kill function with parameters. [4]

(*c*) What are real effective and save ids. [3]

(*d*) Differentiate between nice and renice (with examples). [4]

Or

6. (*a*) Differentiate between user mode and kernel mode instructions. [4]

(*b*) How does a user level process change to kernel mode ? Explain. [2]

(*c*) Explain how kill function can be used to send signal to a group of processes also give the syntax of kill function. [4]

(*d*) What is the shadow password file ? Where does user password reside in unix. [3]

7. (*a*) Write a short note on RAID and its levels. [6]

(*b*) Explain the process of mounting and unmounting a pendrive. [4]

(*c*) Explain the fields in /etc/group file. [3]

Or

8. (*a*) What is meant by disk partitioning and disk formatting. [4]

(*b*) What is the native file of Linux and Unix. Differentiate between Unix and Linux. [4]

(*c*) What are the startup files ? What are its tasks ? [3]

(*d*) How to set the password for user account in linux/unix. [2]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1075

S.E. (Computer Engineering) (First Semester) EXAMINATION, 2015

MICROPROCESSOR ARCHITECTURE

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer any *four* questions, Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

1. (*a*) Explain and draw bit pattern for flag register of 80386 DX with significance of each bit. [6]

(*b*) List the features of 80386 DX microprocessor. [3]

(*c*) Explain in brief instruction queue to 8086 microprocessor. [3]

Or

2. (*a*) Explain architecture of 8086 microprocessor with the help of neat block diagram. [6]

P.T.O.

(*b*) Explain the purpose of pointers and index registers. [3]

(*c*) How many segment registers are used by 8086 ? Mention the use. [3]

3. (*a*) Differentiate between CALL and JMP. [3]

(*b*) Explain control inputs BS16# with the help of timing diagram for 16-bit data transfer. [5]

(*c*) Differentiate between direct index addressing mode and base index addressing mode. [4]

Or

4. (*a*) Explain protected mode & V86 mode. [4]

(*b*) Explain the idle and wait state machine cycle with the help of timing diagram. [5]

(*c*) Explain the following instruction with an example : [3]

(*i*) ENTER

(*ii*) LEAVE

(*iii*) BOUND

5. (*a*) What are the advantages of multicore designing ? [3]

(*b*) What are the advantages of cache memory ? [4]

(*c*) Explain the execution model of SIMD with neat diagram. [6]

Or

6. (*a*) What are the advantages of Hyperthreading technology ? [4]

(*b*) What are the *three* common configuration that support multi-processing ? Explain. [6]

(*c*) Define chip multiprocessing. [3]

7. (*a*) Give the features of SS_E. [6]

(*b*) Enlist data types of 64-bit architecture. [3]

(*c*) Explain Hypertheading with advantages and disadvantages. [4]

Or

8. (*a*) Draw and explain the block diagram of 64-bit architecture. [6]

(*b*) Explain virtualization technology. [4]

(*c*) Explain briefly the compatability mode and 64-bit mode of IA 64 architecture. [3]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1076

S.E. (Computer) (Second Semester) EXAMINATION, 2015

OBJECT ORIENTED AND MULTICORE PROGRAMMING

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right side indicate full marks.

(*iii*) Use of calculator is allowed.

(*iv*) Assume suitable data if necessary.

1. (*a*) Explain the following terms with respect to object oriented programming : [8]

(1) Dynamic look-up

(2) Delegation

(3) Implicit and Explicit Function

(4) Merits and demerits of friend function.

(*b*) What are different formatting activities supported by Stream manipulators ? Support with suitable examples. [4]

Or

2. (*a*) What is abstraction ? Why is it important ? Describe abstract base class. Illustrate an example to explain it. [8]

P.T.O.

(*b*) What do you mean by type conversion ? Explain the same with example. [4]

3. (*a*) What is the importance of Process control block ? Explain its structure. [4]

(*b*) Explain challenges in multicore software development. [4]

(*c*) What is overloading template ? Explain it with an example. [4]

Or

4. (*a*) Explain data-race and deadlocks in multicore programming. [8]

(*b*) Explain the exception handling mechanism in C++. [4]

5. (*a*) Explain the different attributes of the pthread_attr_t object which can be modified by the creator of the thread. [9]

(*b*) Explain the significance of hardware thread and software thread. [4]

Or

6. (*a*) Explain thread priorities and the different thread scheduling policies. [9]

(*b*) Compare process context and thread context. [4]

7. (*a*) Explain Interprocess Communication (IPC) and explain any *two* ways of implementing IPC. [8]

(*b*) Write a note on "Critical Section". [5]

Or

8. (*a*) Explain the use of semaphores and mutex to prevent race conditions and deadlocks. [8]

(*b*) Explain messages queues as the IPC mechanism. [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

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[4757]-1077

S.E. (Computer Engineering) (Second Semester) EXAMINATION, 2015

MICROPROCESSOR AND INTERFACING TECHNIQUES

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer total *four* questions. Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

1. (*a*) What are different components of MS-DOS ? Explain DOS loading with the help of neat diagram. [8]

(*b*) Compare 8086, 80386 and i7 processor on the basis of architectural features. [4]

Or

2. (*a*) Draw and explain block diagram of 8259APIC. [8]

(*b*) Write the initialization instructions of 8259A PIC, to meet the following specifications : [4]

(*i*) Interrupt type 32

P.T.O.

(*ii*) Edge Triggered, single and ICW4 needed, interval of 8

(*iii*) Mask IR1 & IR3 interrupts.

3. (*a*) Draw and explain I/O of BSR mode of 8255 with appropriate control word formats. [4]

(*b*) Draw and discuss internal block diagram of 8251 USART. [6]

(*c*) Define Resolution and Offset error terms of ADC. [2]

Or

4. (*a*) Design a control word format for square wave generator with 1ms period, the input frequency for 8253 is 1 MHz. [4]

(*b*) Draw and explain the following 8279 commands : [4]

(*i*) Keyboard/Display mode set command

(*ii*) Read FIFO/Sensor RAM command.

(*c*) Explain with neat diagram sequence of DMA operation. [4]

5. (*a*) Draw and discuss the interface between 8086 and 8087. [7]

(*b*) With proper timing diagram explain Read cycle in minimum mode of 8086 microprocessor. [6]

Or

6. (*a*) With the help of neat diagram explain minimum mode configuration of 8086. [6]

(*b*) Draw and explain format of control and status word of 8087 NDP. [4]

(*c*) Explain the following 8087 instructions with *one* example each : [3]

(*i*) FSQRT

(*ii*) FLDZ

(*iii*) FADD

7. (*a*) Explain the features of 82801 IJR I/O Controller Hub. [5]

(*b*) Draw and explain block diagram of X58 Chipset. [8]

Or

8. (*a*) Draw and explain block diagram of i5 motherboard. [8]

(*b*) Write a short note on Intel's QPI Technology. [3]

(*c*) Explain ICH10 PCI Interface. [2]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1078

S.E. (Computer) (Second Semester) EXAMINATION, 2015

COMPUTER GRAPHICS AND GAMING

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Assume suitable data, if necessary.

(*iii*) Attempt Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**.

1. (*a*) Describe Frame buffer display in computer graphics. [4]

(*b*) Explain display file and its structure. [4]

(*c*) Explain Bresenham's Line drawing algorithm. [4]

Or

2. (*a*) Write short notes on : Persistence, Resolution, Aspect ratio. [4]

(*b*) Write the properties of video display devices. [4]

(*c*) Using DDA algorithm find out which pixels would be turned on for the line with end points(1, 1) to (5, 3). [4]

P.T.O.

3. (*a*) Write Cohen-Sutherland line clipping algorithm. [4]

(*b*) Explain concept of viewing parameters with an example. [4]

(*c*) What is meant by coherence and how it can increase the efficiency of scan line polygon filling. [4]

Or

4. (*a*) Write the transformation matrix for translation and scaling. [2]

(*b*) Write algorithm to fill the polygon area using flood fill method. [4]

(*c*) Explain the concept of 2D rotation about an arbitrary point with matrix representation. [6]

5. (*a*) Compare RGB and HSV color model. [3]

(*b*) Explain the procedure to generate B-spline curve. [4]

(*c*) What is surface shading algorithm ? Explain phong shading. [6]

Or

6. (*a*) What are the advantages of Warnock's algorithm ? [3]

(*b*) Explain the concept of reflection, shadows and ray tracing. [4]

(*c*) Explain Hilbert's curve with an example. [6]

7. (*a*) What are the applications of morphing ? [3]

(*b*) Write a short note on 3D maxstudio or Maya. [4]

(*c*) Describe the various operations carried out on the segment. [6]

Or

8. (*a*) Explain image transformations with example. [3]

(*b*) Write advantages and disadvantages of segments. [4]

(*c*) Draw block diagram of i860. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1079

S.E. (Computer) (Second Semester) EXAMINATION, 2015

COMPUTER ORGANIZATION

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Solve Q. **1** *or* Q. **2**, Q. **3** *or* Q. **4**, Q. **5** *or* Q. **6**, Q. **7** *or* Q. **8**.

(*ii*) Figures to the right indicate full marks.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Differentiate between microprocessor and micro-controller. [6]

(*b*) What is the need of coprocessor ? How is it interface with CPU ? [6]

P.T.O.

Or

2. (*a*) What are the factors to be considered for processor level parallelism ? [6]

(*b*) Differentiate between RISC and CISC. [6]

3. (*a*) Explain the design of multiplier control unit using Delay Element method. [6]

(*b*) What is microprogrammed control unit design ? Draw and explain basic structure of micro-programmed control unit. [7]

Or

4. (*a*) Write a short note on sequential ALU. [7]

(*b*) Write and explain control sequence for ADD [R3], R1. [6]

5. (*a*) Compare memory mapped I/O and IO mapped I/O. [4]

(*b*) What are different types of bus interfaces ? Explain in detail USB bus organization. [8]

Or

6. (*a*) Write a short note on Intel Nehalem memory organization. [6]

(*b*) What is need of DMA ? How it works ? [6]

7. Write short notes on (any *two*) : [13]

(*i*) AMD Multicore Opteron

(*ii*) IBM Cell Broadband Engine

(*iii*) Power PC.

Or

8. (*a*) What do you mean by 64 bit architectures ? What are features of it ? [6]

(*b*) What are the features of IA-64 model ? [7]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4757]-108

S.E. (Civil) (Second Semester) EXAMINATION, 2015

SURVEYING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Your answer will be valued as a whole.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

(*vi*) Answer any *three* questions from Section I and any *three* questions from Section II.

SECTION I

1. (*a*) Define surveying. Explain the type of survey based on instruments. [5]

(*b*) What is local attraction ? Explain how it is detected ? [5]

P.T.O.

(*c*) The following are the bearings of the line of the traverse PQRST in a running a compass traverse :

Line	For Bearing	Back bearing
PQ	242° 00'	63° 00'
QR	89° 45'	270° 15'
RS	70° 00'	250° 00'
ST	292° 45'	112° 45'
TP	20° 00'	198° 30'

Calculate the included angles and usual checks. Also draw the neat sketch. [8]

Or

2. (*a*) State and explain the accessories required for plane table surveying ? What are their functions ? [6]

(*b*) State the method of plane table surveying. Explain intersection method with suitable sketch. [6]

(*c*) The following are the observed bearings of the line of the traverse ABCDEA with a compass in a place where local attraction was suspected : [6]

Line	Fore Bearing	Back bearing
AB	191° 45'	13° 00'
BC	39° 30'	222° 30'
CD	22° 15'	200° 30'
DE	242° 45'	62° 45'
EA	330° 15'	147° 45'

Calculate the corrected bearings of the lines.

3. (*a*) Define the following terms with sketches : [6]

(*i*) Line of collimation

(*ii*) Contour

(*iii*) Reduced level.

(*b*) Differentiate between direct and indirect methods of contour. [4]

(*c*) The following notes refer to the reciprocal level with taken one level : [6]

Instrument at Station	**Staff reading on**		**Remarks**
	A	**B**	
A	1.156	2.597	Dist. Between A and B = 1200 m
B	0.987	2.418	RL of A = 625.555 m

Find :

(*i*) True RL of B

(*ii*) Combined correction for curvature and refraction

(*iii*) Errors in collimation adjustment of the instrument.

Or

4. (*a*) Explain the principal axes of dumpy level with sketches. [5]

(*b*) Write a short note on uses of Toposheets. [5]

(*c*) The following set of observations were taken with dumpy level, calculate missing values of the following table and apply usual checks : [6]

SN	BS	IS	FS	HI	RL	Remarks
1	2.300			X	270.950	BM
2		X			271.420	
3	3.795		1.050	275.995	X	CP
4		X			273.534	
5		X			274.201	
6			X		274.868	Last point

5. (*a*) Define the following terms with sketches : [6]

(*i*) Latitude

(*ii*) Telescope inverted

(*iii*) Face left

(*iv*) Plunging

(*b*) Explain the different cases of omitted measurements. [6]

(*c*) Explain the procedure of measurement of vertical angle by 20" Theodolite. [4]

Or

6. (*a*) Explain the following : [4]

(*i*) Consecutive coordinates

(*ii*) Independent coordinates.

(*b*) Explain the procedure of measurement of horizontal angle by 20" Theodolite by repetition method. [6]

(*c*) Write short notes on : [6]

(*i*) Adjustment of closed traverse

(*ii*) Use of Theodolite traverse.

SECTION II

7. (*a*) Explain any *two* permanent adjustments of transit Theodolite with sketch. [6]

(*b*) What is tachometer ? State the situations where it is used. [5]

(*c*) A tachometer was set up at an intermediate point on a P and the following readings were obtained on a vertically held staff : [7]

Inst. station	**Staff station**	**Vertical angle**	**Staff intercept readings (m)**			**Remark**
			Upper	**Middle**	**Lower**	
P	BM	–5° 0"	1.00	1.250	1.450	RL of BM = 1000.00 m
	Q	+ 10° 0"	0.900	1.100	1.400	

The constants were 100 and 0.1. Calculate the horizontal distance PQ and RL of Q.

Or

8. (*a*) What is tachometry ? What are its advantages and disadvantages ? [6]

(*b*) Derive the expression for the horizontal distance and vertical distance when the staff held is vertical. [6]

(*c*) Describe the principle of stadia tachometry. [6]

9. (*a*) What are the types of curve ? State its suitability. [4]

(*b*) Explain setting out a simple circular curve by chord produced method. [4]

(*c*) Tabulate the data required for setting out a circular curve by Rankine's method considering the following data : [8]

(*i*) Angle of intersection = 135°

(*ii*) Change of point intersection = 1620 m.

(*iii*) Degree of curve = 5°

(*iv*) Peg interval = 30 m.

Or

10. (*a*) Explain setting out a simple circular curve by Rankine's method. [5]

(*b*) Draw the neat sketch of transition curve. State necessity of transition curve. [5]

(*c*) Two tangents AB and BC intersects at a point B at chainage 150.50 m, the radius of curve is 100 m and deflection angle is 30°. Calculate the data required for setting out a circular curve by offsets from long chord method. [6]

11. (*a*) Explain with neat sketch the setting out of building with conventional instruments. [5]

(*b*) What do you understand by horizontal and vertical controls in construction survey ? What are the requirements of good control ? [6]

(*c*) Describe the procedure of laying alignment of drainage line. [5]

Or

12. (*a*) Explain in brief the procedure of transferring the alignment of tunnel through the shaft. [5]

(*b*) What do you mean by reconnaissance survey of road ? What data is collected during this survey ? [6]

(*c*) Write a short note on Total station. [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-1080

S.E. (Computer) (First Semester) EXAMINATION, 2015

DISCRETE STRUCTURE

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Assume suitable data, if necessary.

1. (*a*) In the first year computer science class of 80 students, 50 knew COBOL, 55 'C' and 46 PASCAL. It was also known that 37 knew 'C' and COBOL, 28 'C' and PASCAL, and 25 PASCAL and COBOL. 7 students however knew none of the language. [4]

(*i*) How many knew all the three languages ?

(*ii*) How many knew exactly two languages ?

(*iii*) How many knew exactly one language ?

P.T.O.

(*b*) Let n be a positive integer Sn, be the set of all divisors of n. Let D denote the relation of 'division'. Draw the diagrams of lattices for : [4]

(*i*) $n = 24$

(*ii*) $n = 30$

(*iii*) $n = 6$.

(*c*) Negate each of the statement : [4]

(*i*) $\forall x, |x| = x$

(*ii*) $\exists x, x^2 = x$

(*iii*) If there is a riot, then someone is killed.

(*iv*) It is day light and all the people are arisen.

Or

2. (*a*) Find the transitive closure of the relation R on : [4]

A = {1, 2, 3, 4) defined by

R = {(1, 2), (1, 3), (1, 4), (2, 1), (2, 3), (3, 4), (3, 2), (4, 2), (4, 3)}

(*b*) Prove by mathematical induction that for : $n >= 1$: [4]

$1.1! + 2.2! + 3.3! + ... + n \,.\, n! = (n + 1)! - 1$

(*c*) Let $f(x) = x + 2$, $g(x) = x - 2$ [4]

$h(x) = 3x$ for x R where R is the set of real number,

find :

(*i*) gof

(*ii*) fog

(*iii*) fof

(*iv*) hog

(*v*) gog

(*vi*) foh

(*vii*) hof

(*viii*) fohog

3. (*a*) Show that in a connected planar graph with 6 vertices and 12 edges, each of the regions is bounded by 3 edges : [5]

(*b*) Show that (G/N, *) is a group. [4]

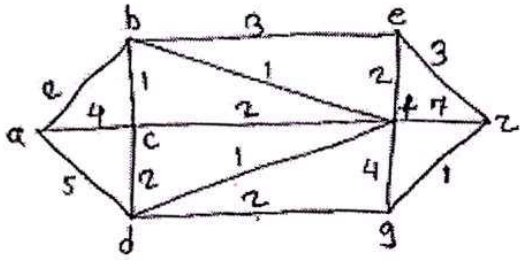
(*c*) Explain the terms : [4]

(*i*) Homomorphism of Group

(*ii*) Automorphism of Group.

Or

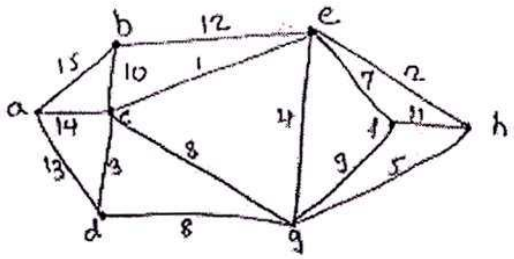
4. (*a*) Find the shortest path between *a*-*z* for the given graph : using Dijkstra's algorithm. [6]



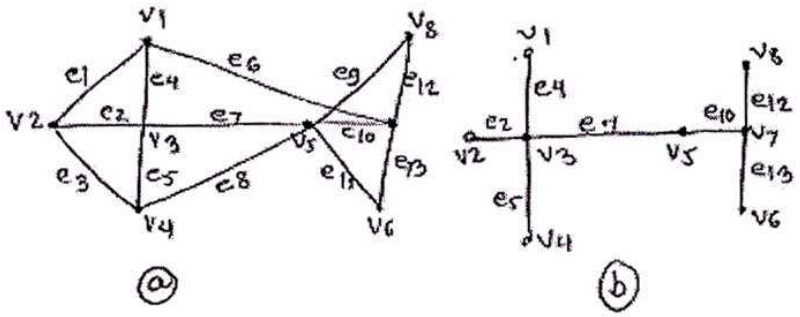
(*b*) Show that R = {*a* + *b*; *b* l) for the operation +, * is an integral domain but not a field. [5]

(*c*) Explain the term Eulerian path and Eulerian circuit with example. [2]

5. (*a*) Obtain the minimum spanning tree using Kruskal algorithm for the following graph. Obtain the total cost of minimum spanning tree. [7]



(*b*) Find the fundamental system of cut-set for the graph G shown below with respect to the spanning tree T. [5]



Or

6. (*a*) A secondary storage media contains information in files with different formats. The frequency of different types of files is as follows. Exe (20), bin(75), bat(20), jpeg(85), dat(51), doc(32), sys(26), c(19), cpp(25), bmp(30), avi(24), prj (29), 1st(35), zip(37). Construct the Huffman code of this. [6]

(*b*) Explain : [6]

(*i*) Eccentricity of a vertex

(*ii*) Cut points

(*iii*) Level and height of a tree.

7. (*a*) Suppose license plate contains 3 English letters followed by 4 digits : [7]

(*i*) How many different license plates can be manufactured if repetition of letters and digits are allowed ?

(*ii*) How many plates are possible if only the letters are repeated ?

(*iii*) How many plates are possible if only the digits are repeated ?

(*b*) Out of 4 officers and 10 clerks, a committee of 2 officers and 3 clerks is to be formed. In how many ways committee can be done if : [6]

(*i*) Any officer and any clerk can be included.

(*ii*) A particular clerk must be in committee.

(*iii*) A particular officer cannot be in committee.

Or

8. (*a*) A student is to answer 10 out of 13 questions in an exam : [6]

(*i*) How many choices has he, if he must answer the first or second questions but not both ?

(*ii*) How many choices has he, if he must answer exactly three out of first five questions.

(*b*) Three students A, B and C are swimming in the race. A and B have, same probability of winning and each is twice as likely to win as C. Find the probability that : [7]

(*i*) B wins

(*ii*) C wins

(*iii*) B or C wins.

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1082

S.E. (IT) (First Semester) EXAMINATION, 2015

COMPUTER ORGANISATION

(2012 COURSE)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

1. (*a*) With suitable diagram explain in brief Von Neumann Architecture. [6]

(*b*) Explain in brief functions of the following pins of 8086 : [6]

(*i*) ALE

(*ii*) $\overline{RD}$

(*iii*) $MN/\overline{MX}$.

P.T.O.

Or

2. (*a*) Draw flow chart and explain Booth's Algorithm for two's complement mutiplication. [6]

(*b*) Draw neat diagram of internal architecture of 8086 and explain any *one* block. [6]

3. (*a*) What are interrupts ? Explain interrupts of 8086. [6]

(*b*) Explain with suitable diagram multiple bus organization of CPU. [7]

Or

4. (*a*) What is segmentation ? List segment registers of 8086 and explain its use in brief. [6]

(*b*) Explain with suitable diagram hardwired control method for design of control unit. [7]

5. (*a*) Explain direct mapping technique used in Cache memory. [6]

(*b*) What is TLB ? Explain its use with suitable diagram. [6]

Or

6. (*a*) List the different types of internal memory explain any *two* in brief. [6]

(*b*) Write a short note on optical memories. [6]

7. (*a*) Draw block diagram of 8255 PPI and explain it. [7]

(*b*) What is DMA ? Explain with neat diagram. [6]

Or

8. (*a*) Compare serial V/s parallel I/O. Explain features of serial I/O USART 8251. [7]

(*b*) List various bus standards interfaces. Explain any *one* in detail with sutiable diagram. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1083

S.E. (I.T.) (First Semester) EXAMINATION, 2015

DIGITAL ELECTRONICS AND LOGIC DESIGN

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4** and Q. No. **5** *or* Q. No. **6** and Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Represent the following decimal numbers in single precision floating point format : [6]

(*i*) 255.5

(*ii*) 110.65

(*b*) What do you mean by open collector output ? Explain with suitable circuit diagram. What is the advantage of this output ? [6]

P.T.O.

Or

2. (*a*) Perform 2's complement arithmetics of : [6]

(*i*) $(7)_{10} - (11)_{10}$

(*ii*) $(-7)_{10} - (11)_{10}$

(*iii*) $(-7)_{10} + (11)_{10}$

(*b*) Draw suitable circuit diagram and explain the drawback of WIRED_OR TTL GATE ? [6]

3. (*a*) What is race around condition ? Explain with the help of timing diagram. How is it removed in basic flip-flop circuit ? [6]

(*b*) Design a sequence generator using shift register and decoder circuit to generate the sequence .....1101011..... . [7]

Or

4. (*a*) How will you convert the basic SR-flip-flop (SR-FF) into JK-flip-flop ? [6]

(*b*) Design a MOD-11 counter using IC7490. Show states with the help of timing diagram. [7]

5. (*a*) Draw the basic structure FPGA. Explain its feature in brief. [6]

(*b*) Implement the following function using programmable logic device : [6]

(*i*) F1 = $\sum m$ (0, 3, 4, 7)

(*ii*) F2 = $\sum m$ (1, 2, 5, 7)

Or

6. (*a*) Draw the basic structure of CPLD. Explain its features in brief. [6]

(*b*) Design a BCD to Excess-3 code convertor using suitable programmable logic device. [6]

7. (*a*) State and explain different data types supported by VHDL. [6]

(*b*) Write features of VHDL. Explain entity architecture declaration for 2 bit NOR and AND gate. [7]

Or

8. (*a*) State and discuss different types of operators used in VHDL. Give precedence of these operators. [6]

(*b*) Describe different modelling styles of VHDL with suitable example. [7]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1084

S.E. (I.T.) (First Semester) EXAMINATION, 2015

FUNDAMENTALS OF DATA STRUCTURES

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data if necessary.

1. (*a*) Explain various bitwise operators in C. Give example of each operator. [4]

(*b*) Illustrate the difference between Union and Structure with suitable example. [4]

(*c*) Write a C program to swap two numbers using call by reference. [4]

P.T.O.

Or

2. (*a*) What is pointer variable ? Explain declaration, initialization and accessing a pointer variable with an example. [4]

(*b*) Explain arrays with example. [4]

(*c*) Explain if and switch-case decision control statement. [4]

3. (*a*) Define the following terms with example : [6]

(*i*) Data object

(*ii*) Data structure

(*iii*) Data type

(*b*) Sort the following and show the status of every pass using selection sort 34, 9, 78, 65, 12, –5. [6]

Or

4. (*a*) Compare linear and non-linear, static and dynamic, primitive and non-primitive data structure. [6]

(*b*) Sort the following data to ascending order using quick sort. Show all passes with pivot : 17, 8, –9, 2, 0, –5, 7, 20, 11, 15. [6]

5. (*a*) Define polynomial. Represent the following polynomial using array : [7]

(*i*) $x^3 + x^2 + x + 16$

(*ii*) $x^5y^4 + x^3y^3 + x^2 + y^2 + 10$

(*b*) Explain simple and fast transpose of a sparse matrix with example. [6]

Or

6. (*a*) Explain sequential memory organization with example. [6]

(*b*) Explain the two-dimensional array in detail with column and row major representation and address calculation in both the cases. [7]

7. (*a*) What are the advantages of linked list over array ? Describe different types of linked list. [7]

(*b*) Write a C function to perform the following operation on SLL : [6]

(*i*) Insert element at any position

(*ii*) Reverse the list without using any DS.

Or

8. (*a*) Write C function to delete any node in case of DLL. [6]

(*b*) Explain the concept of GLL and represent the following GLL : [7]

(*i*) ((*a*, *b*), (*c*, *d*), *e*)

(*ii*) (*a*, (*b*, *c*), *d*)

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-1085

S.E. (Information Technology) (First Semester) EXAMINATION, 2015

PROBLEM SOLVING & OBJECT ORIENTED

PROGRAMMING CONCEPTS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** and Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What are the various types of modules ? Explain the term coupling and cohesion related to module. [6]

(*b*) What is the difference between an expression and equation ? Write an equation to calculate the following : [4]

(*i*) The average of five numbers.

P.T.O.

(*ii*) The sale price of an item given an original price and a percentage discount.

(*iii*) The amount when the principal, interest and period of time is given.

(*c*) Evaluate for A = 5, B = 3 and C = 2 : [2]

(*i*) F = A * C\(A + C)

(*ii*) F = (C * (B + 3 * A) + 5 * A)/C

Or

2. (*a*) Design an algorithm to calculate the salary of an employee using the following problem solving strategies : [8]

(*i*) Sequential logic

(*ii*) Decision logic

(*iii*) Loop logic

(*iv*) Selection logic

To calculate the salary consider designation, no. of days worked, wages per day, basic salary, allowances and deductions. Calculate salary according to designation of employee.

(*b*) Define Algorithm. What are the various types of algorithm ? Explain them with suitable example. [4]

3. (*a*) An instructor has a class of 25 students. Each student is identified by a number from 1 to 25. All tests are stored in a 2-dimensional array, with each column containing the grades for each test. The instructor would like to enter the student number and the test number and have the grade for that test printed on the monitor. Develop a solution to output the needed information. [6]

(*b*) Explain how the polymorphism is achieved in C++ with suitable examples. [6]

Or

4. (*a*) Define constructor and destructor. Explain various types of constructors with syntax. [6]

(*b*) Explain the algorithm to count the number of times a particular word occurs in a text. [6]

5. (*a*) Explain with a suitable example how code reusability is achieved in C++. [6]

(*b*) What are the various rules for overloading the operators ? [4]

(*c*) Define Friend Class. Explain the concept of forward declaration of a class. [3]

Or

6. (*a*) Define inheritance. Explain various types of inheritance with suitable example. [10]

(*b*) What is an operator function ? Describe the syntax of an operator function. [3]

7. (*a*) What is generic programming ? How is it implemented in C++ ? [3]

(*b*) Define exception. Explain various types of exception with example. [10]

Or

8. (*a*) Describe briefly the features of I/O system supported by C++. [4]

(*b*) Explain how the exception is handled in C++. [4]

(*c*) What is STL ? Explain various components of STL. [5]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-1086

S.E. (I.T.) (Second Semester) EXAMINATION, 2015

DATA STRUCTURES AND FILES

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer *four* questions.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Change the following infix to postfix using stack. Clearly indicate the content of stack : [6]

(*i*) (A + B) * C – D * F + C.

(*ii*) (A – 2) * (B + C – D * E) * F.

(*b*) Explain the implementation of circular queue using sequential organization. [6]

P.T.O.

Or

2. (*a*) Implement Stack as an ADT using linked Organization. [6]

(*b*) Specify which of the following application would be suitable for a first-in-first-out queue and justify your answer : [4]

(*i*) A program is to keep track of patients as they check into a clinic, assigning them to doctors on a first come, first served basis.

(*ii*) An inventory of parts is to be processed by part number.

(*iii*) A dictionary of words used by spelling checker is to be created.

(*iv*) Customers are to take numbers at a bakery and be served in order when their number come-up.

(*c*) Define Multiqueues. [2]

3. (*a*) Write a function for creating Binary Search Tree. [4]

(*b*) Define a graph. For the given adjacency matrix draw the graph and its adjacency list : [8]

	A	B	C	D	E	F	G	H
A	0	1	1	0	0	1	0	0
B	1	0	0	0	1	0	0	0
C	1	0	0	1	0	0	0	0
D	0	0	1	0	0	0	0	1
E	0	1	0	0	0	0	0	1
F	1	0	0	0	0	0	1	0
G	0	0	0	0	0	1	0	1
H	0	0	0	1	1	0	1	0

Find all the nodes adjacent to node A, node F and node G.

Or

4. (*a*) Construct a binary tree from the given traversals : [4]

Pre-order : * + *a* – *b* *c* / – *d* *e* – + *f* *g* *h*

In-order : *a* + *b* – *c* * *d* – *e* / *f* + *g* – *h*

(*b*) With example define the following terms wrt graphs : [4]

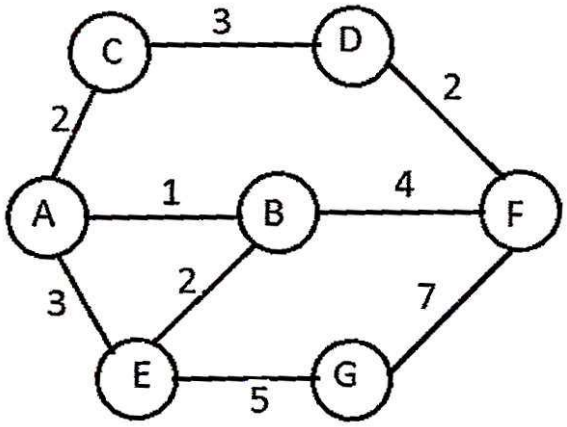
(*i*) Degree of node

(*ii*) Isolated node

(*iii*) Path

(*iv*) Cycle.

(*c*) For the given graph show stepwise representation of MST using Kruskal's algorithm. [4]



5. (*a*) Create a Huffman's tree for the given data set and find the corresponding Huffman's codes : [6]

Data	**Weight**
A	10
B	3
C	4
D	15
E	2
F	4
G	2
H	3

(*b*) Create hash table and resolve collision using linear probing with replacement : [4]

Table Size = 10 Hash Function = key%10

9, 45, 13, 59, 12, 75, 88, 11, 105, 46

(*c*) Consider hash table in Q5b. After the hash table is 70% full apply rehashing and resolve collision for the same data. [4]

Or

6. (*a*) Construct an AVL search tree by inserting the following elements in the order of their occurrence. Show the balance factor and type of rotation at each stage : [6]

55, 66, 77, 15, 11, 33, 22, 35, 25, 44, 88, 99

(*b*) Write C++ program to implement priority queue using a Heap Data Structure. [8]

7. (*a*) Distinguish between logical and physical deletion of records and illustrate it with example. [6]

(*b*) With the prototype explain the inbuilt functions in 'C' language for reading and writing character and record in a file. [6]

Or

8. (*a*) Explain different file opening mode with example in C++. [6]

(*b*) Explain the concept of : [6]

(*i*) Primary Indexes

(*ii*) Clustering Indexes

(*iii*) Secondary Indexes.

Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[4757]-1087

S.E. (I.T.) (Second Semester) EXAMINATION, 2015

FOUNDATION OF COMPUTER NETWORKS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**.

(*ii*) Figures to the right indicate full marks.

(*iii*) Assume suitable data, if necessary.

(*iv*) Neat diagrams must be drawn wherever necessary.

1. (*a*) Distinguish between baseband transmission and broadband transmission. [4]

(*b*) Explain pulse code modulation. [4]

(*c*) List the line coding schemes in digital transmission. Explain Polar NRZ scheme. [4]

Or

2. (*a*) Explain various transmission impairments in detail. [6]

(*b*) Draw and explain FDM and TDM. [6]

3. (*a*) Explain ISO-OSI model in detail. [8]

(*b*) Write a short note on Virtual circuit networks. [5]

P.T.O.

Or

4. (*a*) Explain with suitable example guided transmission media and unguided transmission media. [8]

(*b*) Write a short note on TCP/IP protocol stack. [5]

5. (*a*) Discuss the concept of redundancy in error detection and correction. [8]

(*b*) Explain linear code block. [5]

Or

6. (*a*) Explain Go-back-N automatic repeat request protocol. [5]

(*b*) What is Checksum ? Describe in detail internet checksum method with suitable example. [8]

7. (*a*) Discuss CSMA/CD random access technique. How is collision avoidance achieved in the same ? [7]

(*b*) Explain TDMA and FDMA. [5]

Or

8. (*a*) Compare and contrast FDMA and CDMA in detail. [8]

(*b*) Explain PPP in detail. [4]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1088

S.E. (Information Technology) (Second Semester) EXAMINATION, 2015

PROCESSOR ARCHITECTURE AND INTERFACING

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Draw the figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Differentiate between procedure and macro. [6]

(*b*) Explain difference between 80386 pipelined and non-pipelined bus cycle with neat diagram. [6]

Or

2. (*a*) Explain the following assembler directives :

(*i*) Public and Extrn

(*ii*) .Org

(*iii*) : Model [6]

P.T.O.

(*b*) State and explain the significance of any *three* interrupt related signals of the 80386. [6]

3. (*a*) Draw and explain the logical address to physical address translation with paging in 80386 processor. [6]

(*b*) What is virtual mode ? How to switch from protected mode to virtual 86 mode. [6]

Or

4. (*a*) Write down the steps to switch from Real Mode (RM) to Protected Mode (PM). [6]

(*b*) Explain the difference between 3 operating models of 80386. [6]

5. (*a*) Identify and justify addressing mode of the following 8051 instructions : [6]

(*i*) MOV @ RO, A

(*ii*) MOV B, 50H

(*iii*) DIV AB.

(*b*) List SFR's used in 8051. Draw and explain SCON and TCON. [7]

Or

6. (*a*) Explain the following instructions in 8051 : [6]

(*i*) MUL AB

(*ii*) SWAP A

(*iii*) MOV DPTR, #3000H

(*b*) List the features of 8051 microcontroller. Draw and explain architecture of 8051. [7]

7. (*a*) How many interrupts are there in 8051 ? List them according to their priority. Explain the IP register structure. [7]

(*b*) Explain any *two* operating modes of timer used in 8051. [7]

Or

8. (*a*) List and classify 8051 interrupts. [7]

(*b*) Draw and explain formats of SBUF and IE. [6]

Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-1089

S.E. (Information Technology) (Second Semester)

EXAMINATION, 2015

COMPUTER GRAPHICS

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Solve Q. **1** *or* Q. **2**, Q. **3** *or* Q. **4**, Q. **5** *or* Q. **6**, Q. **7** *or* Q. **8**.

(*ii*) Figures to the right indicate full marks.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Assume suitable data, if necessary.

1. (*a*) List the methods for character generation. Explain any *one* character generation method briefly. [6]

(*b*) Describe the 2-D transformation matrix for rotation about arbitrary point. [6]

Or

2. (*a*) Write C code for Bresenham's line drawing algorithm. [6]

P.T.O.

(*b*) Find out the final co-ordinates of a figure bounded by the co-ordinates (1, 1), (3, 4), (5, 7) and (10, 3) when scaled by two units in X direction and three unit in Y direction. [6]

3. (*a*) Explain Cohen-Sutherland Line Clipping method with suitable example. [6]

(*b*) Explain 3D transformation-Rotation about arbitrary axis. [6]

Or

4. (*a*) Explain with example Window to Viewport transformation. [6]

(*b*) Explain parallel and perspective projection with diagram. [6]

5. (*a*) Explain the difference between RGB and CMY(K) color model. [6]

(*b*) What is colour mixing ? Explain in detail. [7]

Or

6. (*a*) What is half-toning and shading ? Explain any *one* type of shading. [6]

(*b*) Explain HSV color model and also compare it with RGB color model. [7]

7. (*a*) Explain Hilbert curve in detail. [6]

(*b*) Explain Bezier curve generation using midpoint subdivision. [7]

Or

8. (*a*) Explain the technique of smoothing of curves using B-Spline. [6]

(*b*) Explain algorithm for fractal lines. [7]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+2**

Seat No.	

[4757]-109

S.E. (Civil) (Second Semester) EXAMINATION, 2015

STRUCTURAL ANALYSIS–I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section I.

(*ii*) Answer Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section II.

(*iii*) Answers to the two sections should be written in separate answer-book.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Figures to the right indicate full marks.

(*vi*) Assume suitable data, if necessary.

(*vii*) Use of non-programmable electronic scientific calculator is allowed.

SECTION I

1. (*a*) State Castigliano's First Theorem and its use in structural analysis. [4]

P.T.O.

(*b*) A simply supported beam of 5 m span is subjected to central point load of 20 kN. Determine the maximum slope and deflection of the beam. [7]

(*c*) Using Moment area method, find the slope and deflection at free end and point C for a cantilever beam with uniform cross section shown in Fig. 1(*c*).

Take E = 2×10^5 MPa, I = 2×10^8 mm^4. [7]

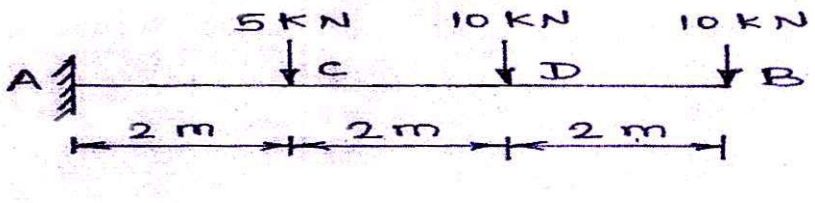


Fig. 1(*c*)

Or

2. (*a*) Calculate the deflection at free end C of beam ABC beam shown in Fig. 2(*a*). Using Castigliano's first theorem. [7]

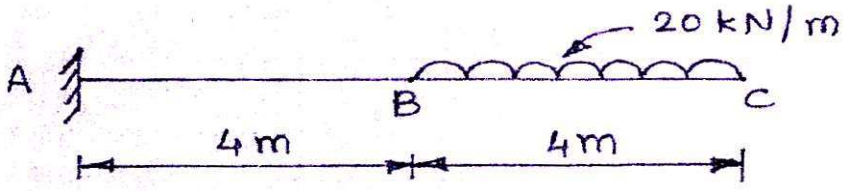


Fig. 2(*a*)

(*b*) Determine the deflection and slope at quarter point C of simply supported beam of span 'L' subjected to an uniformly distributed load w per unit length. Use Conjugate Beam Method. [7]

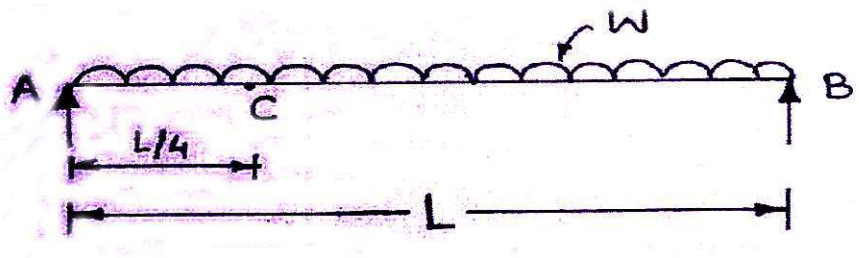


Fig. 2(*b*)

(*c*) Explain with sketches the types and classification of structures based on structural forms. [4]

3. (*a*) Analyse the two span continuous beam as shown in Fig. 3(*a*), using three moment theorem. [8]

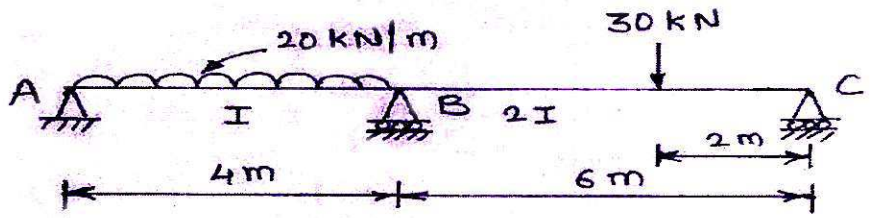


Fig. 3(*a*)

(*b*) A fixed beam AB of span 8 m carries uniformly distributed load of 60 kN/m over span of 2 m from A. Find fixed end moments from first principle. Draw SFD and BMD. [8]

Or

4. (*a*) Analyze prop cantilever beam of span L subjected to udl w/m throughout the span and draw SFD and BMD. [8]

(*b*) A fixed beam of span 8 m carries two point loads of 40 kN and 50 kN acting at 2 m and 4 m from left support. Find fixed end moments by First principal and check the values with standard formula. [8]

5. Find the forces of the truss supported and loaded as shown in Fig. 5. The cross-section area of vertical and horizontal members is 4000 mm^2 and that of diagonals is 6000 mm^2. [16]

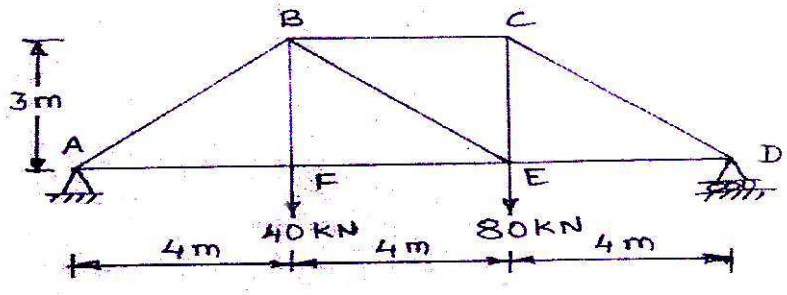


Fig. 5

Or

6. The truss shown in figure 6. Find central deflection. Take E = 200 kN/mm^2, if : [16]

(*a*) Area of all lower horizontal members = 2500 mm^2

(*b*) Area of all upper horizontal members = 4000 mm^2

(*c*) Area of all vertical members = 2000 mm^2

(*d*) Area of diagonal members = 4250 mm^2

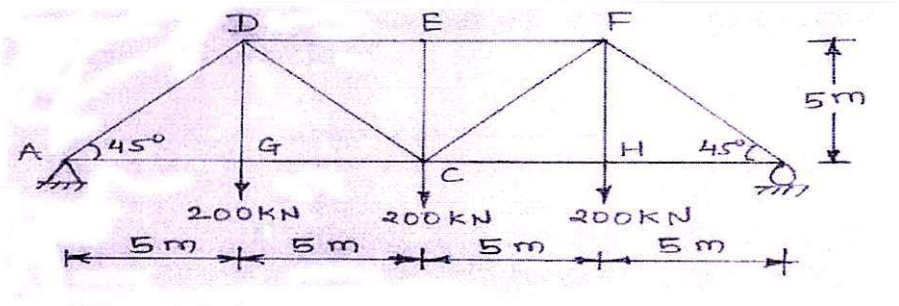


Fig. 6

SECTION II

7. (*a*) What is shape factor ? Obtain shape factor for solid rectangular section. [4]

(*b*) Find shape factor for unsymmetrical I–section as shown in Fig. 7(*b*). [7]

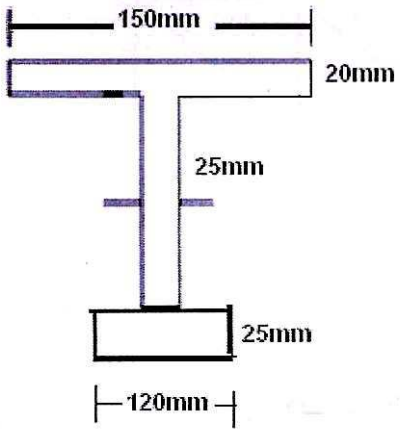


Fig. 7(*b*)

(*c*) Find the collapse load for a continuous beam ABCD loaded as shown in Fig. 7(*c*). [7]

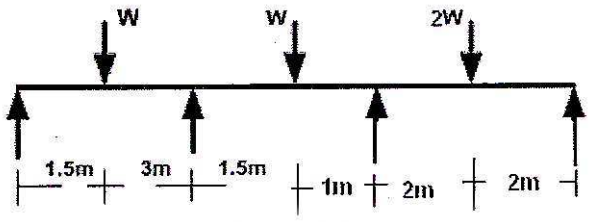


Fig. 7(*c*)

Or

8. (*a*) State and explain the concept of plastic hinge. Explain step by step, how plastic hinge is developed in beams under gradually applied load. Draw various shapes of stress diagram. [9]

(*b*) The frame loaded with a point load of 10 kN is as shown in Fig. 8(*b*). Determine the values of plastic moment of the frame when loaded up to collapse. [9]

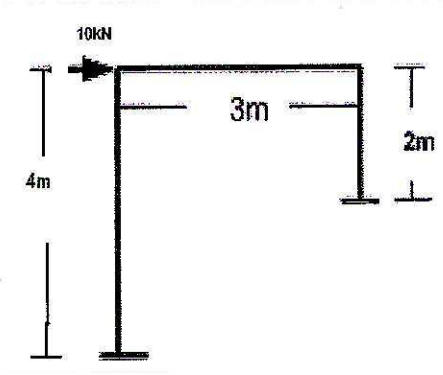


Fig. 8(*b*)

9. (*a*) Draw ILD for the reaction at A, B and C. Also draw ILD for shear force at midpoint of AB and BC for the beam shown in Fig. 9(*a*). [8]

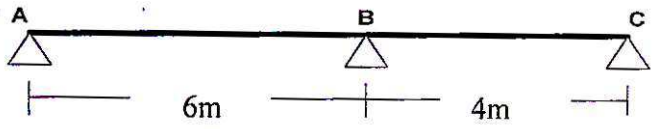


Fig. 9(*a*)

(*b*) Construct ILD for the forces in the members : [8]

U2U3, U3L3, L2L3 and U2L3

for the truss shown in Fig. 9(*b*).

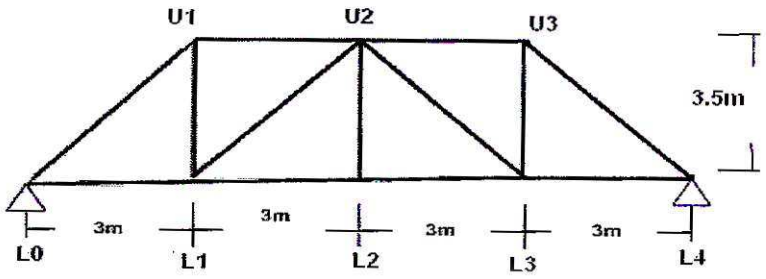


Fig. 9(*b*)

Or

10. (*a*) Using influence lines, obtain then reactions at support A and B for the beam ABC with an overhang BC . AB = 6 m, BC = 1 m. It is loaded with udl of intensity of intensity 50 kN/m on span AB and 20 kN/m on span BC. [8]

(*b*) Plot ILD for reactions at A and B supports and S.F. and B.M. at point 'E' and 'D' for the beam shown in Fig. 10(*b*). 1(CE) = 1(EA) = 0.5, 1(AE) = L/3, 1(EB) = 2 L/3. [8]

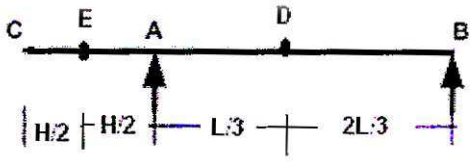


Fig. 10(*b*)

11. (*a*) A uniformly distributed load of 185 kN/m of 7 m long crosses a girder AB of span 15 m. Calculate maximum shear force and maximum bending moment at a section 9 m from end A. [8]

(*b*) The train of loads crosses the girder AB as shown in Fig. 11(*b*). Find the maximum positive and negative end shear for the girder. Assume 90 kN load leading the train : [8]

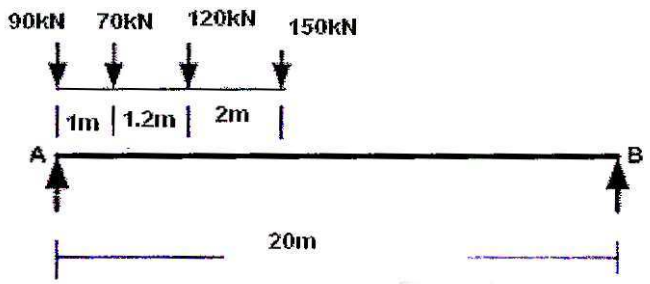


Fig. 11(*b*)

Or

12. (*a*) Two wheel loads 350 kN and 125 kN are spaced 2.2 m apart and are moving on a girder AB of 12 m span. Any wheel can lead the other. Find : [8]

(*i*) Max. Positive and max. negative shear force at 7 m from 'A'

(*ii*) Maximum end shears.

(*b*) Find absolute maximum bending moment under leading load 100 kN for the girder shown in Fig. 12(*b*). [8]

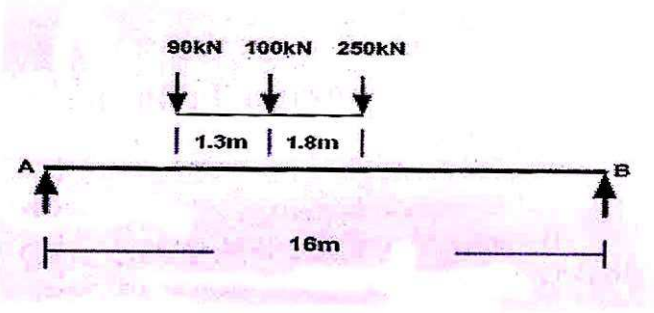


Fig. 12(*b*)

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-1090

S.E. (Information Technology) (I Semester) EXAMINATION, 2015

DISCRETE STRUCTURE

(2012 Pattern)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Prove the statement is true using mathematical induction : [6]

$n^3 + 2n$ is divisible by 3 for all $n >= 1$

(*b*) Find the transaction closure by using Warshall's algorithm for the given relation as : [6]

R = {(1, 1), (1, 4), (2, 1), (2, 2), (3, 3), (4, 4).

P.T.O.

Or

2. (*a*) Solve the following recurrence relation : [6]

$$a_n - 7a_{n-1} + 10a_{n-2} = 0,\ a_0 = 0,\ a_1 = 3$$

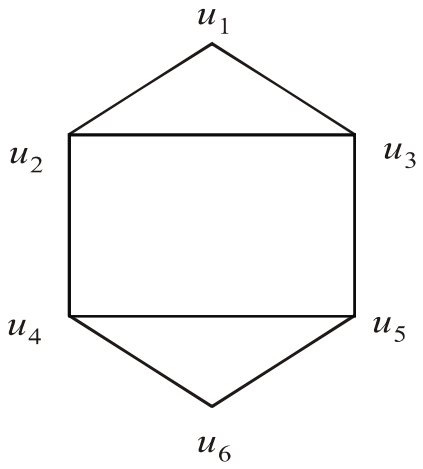
(*b*) A survey of 70 high school students revealed that 35 like folk music, 15 like classical music, and 5 like both. How many of the students surveyed do not like either folk or classical music ? [6]

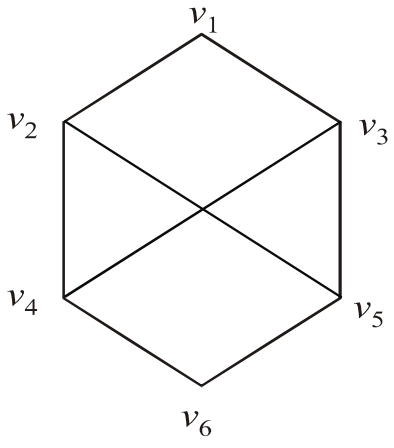
3. (*a*) Determine whether the following sets together with binary operation represent a group. If so, determine if it is abelian or not, specify the identity & inverse. [6]

(*i*) Set of odd integers, binary operation : multiplication

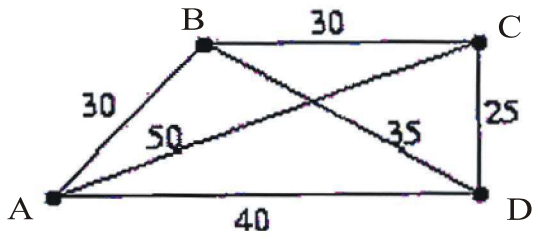
(*ii*) Set of all rational numbers binary operation : addition.

(*b*) (*i*) Determine graph G and H shown in figure are isomorphic or not ? Justify your answer. [6]



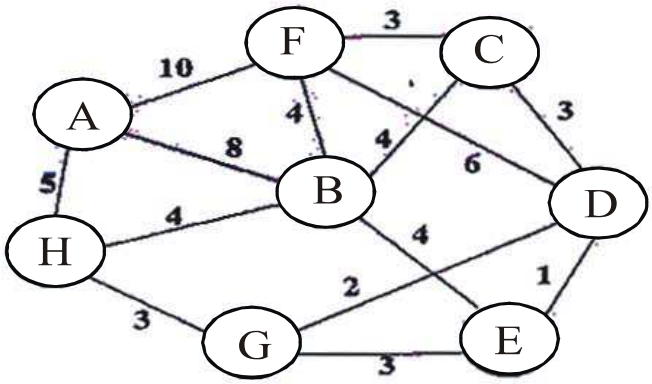


(*ii*) Find the Hamiltonian circuit using nearest neighbor method

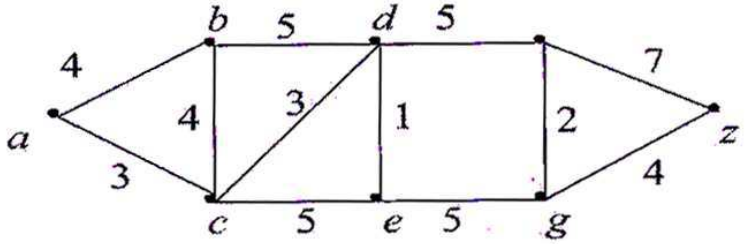


Or

4. (*a*) Find minimum spanning tree and its minimum weight using Prim's algorithm. [6]

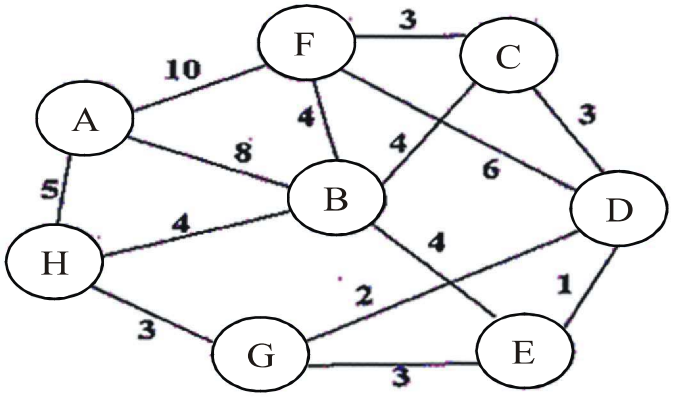


(*b*) Find the shortest path using Dijkstra's algorithm for the given graphs. [6]



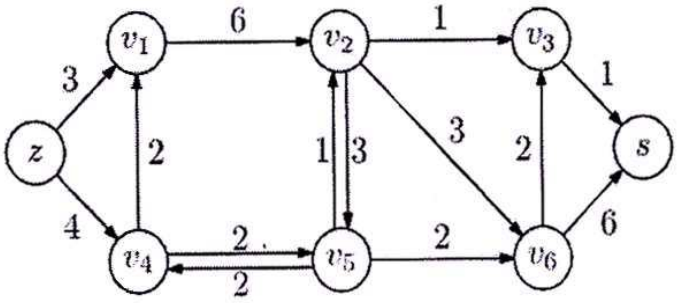
5. (*a*) Construct an optimal binary tree for the set of weights as {15, 22, 9, 11, 10, 13, 8}. Find the weight of an optimal tree. Also assign the prefix codes and write the code words. [6]

(*b*) Find the minimum spanning tree and weight of it for the given graph using Kruskal's algorithm. [7]



Or

6. (*a*) Find the maximum flow for the following transport network. [6]



(*b*) Construct a binary tree with the inorder traversal as 3, 5, 6, 7, 10, 12, 13, 15, 16, 18, 20, 23 and preorder traversal as 15, 5, 3, 12, 10, 6, 7, 13, 16, 20, 18, 23 [7]

7. (*a*) A die is rolled and a coin is tossed, find the probability that the die shows an odd number and the coin shows a head. [4]

(*b*) In how many ways can 6 men and 5 women be seated in a line so that no two women sit together ? [3]

(*c*) What is the number of ways of choosing 4 cards from a pack of 52 playing cards ? In how many of these : [6]

(*i*) Four cards are of the same suit

(*ii*) Four cards belong to four different suits

(*iii*) Cards are of same color.

Or

8. (*a*) A basket contains 30 apples, 20 pears and 10 peaches. What is the probability that the first piece of fruit taken from the basket will be a peach ? [4]

(*b*) In how many ways can three prizes be distributed among four winners so that no one gets more than one prize ? [3]

(*c*) An 8 member team is to be formed from a group of 10 men and 15 women. In how many ways can the team be chosen if : [6]

(*i*) The team must contain 4 men and 4 women

(*ii*) There must be more men than women

(*iii*) There must be at least two men.

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-110

S.E. (Civil) (Second Semester) EXAMINATION, 2015

FLUID MECHANICS-I

(2008 Pattern)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two sections should be written in separate answer-books.

(*ii*) Answer any *three* questions from each section.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

Section I

1. (*a*) Using Buckingham's π-theorem, show that the velocity through a circular orifice is given by : [8]

$V = \sqrt{2}\ gH\ f[D/H,\ \mu/(\rho VH)]$

P.T.O.

Where

H = head causing flow

D = diameter of the orifice

μ = coefficient of dynamic viscosity

ρ = mass density &

g = acceleration due to gravity

(*b*) Define and explain the terms : [4]

(*i*) Kinematic and dynamic viscosity

(*ii*) Compressibility and elasticity.

(*c*) A model 1/20th of prototype of a spillway is to be tested. Find the following : [6]

(*i*) Prototype velocity when model velocity is 2 m/s

(*ii*) Prototype discharge per unit width when model discharge is 0.25 m^3/s

(*iii*) Pressure head in prototype when model pressure head is 5 cm of mercury.

Or

2. (*a*) Write short notes on the following : [6]

(*i*) Capillarity

(*ii*) Surface tension.

(*b*) Explain Froude's Model law and importance of model studies. [4]

(*c*) A body weighing 441.45 N with a flat surface area of 0.093 m^2 slides down lubricated inclined plane making an angle of 30° with the horizontal. For viscosity of 0.1 Ns/m^2 and body speed of 3 m/s, determine the lubricant film thickness. [8]

3. (*a*) Derive an expression for total pressure and the depth of centre of pressure from free surface of liquid, at inclined plane surface submerged in the liquid. [8]

(*b*) How thick is the layer of mud of S.G. 1.6, at the bottom of tank if the water 7.5 m deep above it, if there is a pressure of 490.5 kN/m^2 against the bottom of the tank ? [8]

Or

4. (*a*) An isosceles triangular plate of base 4 m and altitude 4 m immersed vertically in an oil of specific gravity 0.9. The base of plate coincides with the free surface of oil. Determine : [8]

(*i*) Total pressure on the plate

(*ii*) Centre of pressure.

(*b*) Define the terms : Stable, unstable and neutral equilibrium for submerged and floating bodies. [8]

5. (*a*) Show that the streamlines and equipotential lines intersect each other orthogonally. What are the uses and limitations of flow net ? [8]

(*b*) The velocity potential function for a two-dimensional flow is $f = x\ (3y - 1)$, at a point P(3, 5) determine : [8]

(*i*) the velocity and

(*ii*) the value of stream function.

Or

6. (*a*) Derive the continuity equation for one-dimensional flow, stating the assumption made in deriving the equation. [8]

(*b*) Given that :

$$U = -\ 4ax\left(x^2 - 3y^2\right)$$

$$V = 4ay\ (3x^2 - y^2)$$

Examine whether these velocity components represent a physically possible two-dimensional flow. If so whether the flow is rotational or irrotational ? [8]

Section II

7. (*a*) In an experiment on determination of hydraulic coefficients of sharp edged orifice, 2.0 cm of diameter, it was found that the jet issuing horizontally under a head of 1 m travelled a horizontal distance of 1.2 m from vena contracta in a course of vertical drop of 0.5 m from the same point. Further if a flat plat held normal to the jet at vena contracta, the force of 5 N would be exerted on the plate. Determine C_c, C_v and C_d for the orifice. [10]

(*b*) Derive Euler's equation of motion for one-dimensional flow. Also derive Bernoulli's equation from it. [8]

Or

8. (*a*) A pipe line carrying gasoline (SG = 0.8) changes in its dia. from 20 cm to 50 cm in a height 5 m. The pressures at the 20 cm and 50 cm dia. are 100 kPa & 60 kPa respectively. The discharge through the pipe is 0.2 m^3/s. Find the loss of head during the flow and direction of flow. [10]

(*b*) State the Bernoulli's equation. List out the assumptions of Bernoulli's equation. [4]

(*c*) Explain the terms briefly : [4]

(1) Potential head

(2) Velocity head.

9. (*a*) For the velocity profile in laminar boundary layer as

$$\frac{u}{U} = \frac{3}{2}\left(\frac{y}{\delta}\right) - \frac{1}{2}\left(\frac{y}{\delta}\right)^3$$

find the thickness of the boundary layer and the shear stress 1.2 m from the leading edge of a plate. The plate is 2 m long and 1.2 m wide and is placed in water which is moving with a velocity of 220 mm per second. Find the total drag force on the plate if μ of water is 0.011 poise. [8]

(*b*) An oil with density 850 kg/m^3 and dynamic viscosity 0.18 N-s/m^2 flows through a 12 cm diameter horizontal pipe. The pressure drop over a 2 m length of pipe is 20 kPa. Determine the average velocity, the flow rate and the wall shear stress. [8]

Or

10. (*a*) What is boundary layer ? Explain with neat sketch the development of boundary layer over a smooth flat plate. [8]

(*b*) A flow in a tube is laminar. Find the distance from the wall surface where the local velocity is equal to the average velocity of the fluid through the tube. [8]

11. (*a*) Derive Karman-Prandtl equation for velocity distribution in turbulent flow near hydrodynamically smooth boundary. [8]

(*b*) Write short notes on : [8]

(*i*) Prandtl's mixing length theory

(*ii*) Hydrodynamically smooth and rough pipes.

Or

12. (*a*) What are the equivalent pipes ? Explain in detail the major and minor losses in pipes. [8]

(*b*) A horizontal pipe 150 mm in diameter is joined by sudden enlargement to a 225 mm diameter pipe. Water is flowing through it at the rate of 0.05 m^3/s. Find : [8]

(*i*) Loss of head due to abrupt expansion

(*ii*) Pressure difference in the two pipes

(*iii*) Change in pressure if the change of section is gradual without any loss

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4757]-111

S.E. (Mech./Auto) (First Semester) EXAMINATION, 2015
ENGINEERING MATHEMATICS–III
(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data if necessary.

SECTION I

1. (*a*) Solve the following DE (any *three*) : [12]

(*i*) $(D - 2)^2 (D + 1)y = e^{2x} + 2^{-x}$

(*ii*) $(D^2 - 6D + 9)y = \frac{e^{3x}}{x^2}$ (by variation of parameters)

(*iii*) $(1 + x)^2 \frac{d^2y}{dx^2} + (1 + x)\frac{dy}{dx} + y = 2\sin[\log(1 + x)]$

(*iv*) $(D^2 - 2D + 5)y = 25x^2$.

(*b*) Solve the simultaneous linear DE with given conditions :

$$\frac{du}{dx} + v = \sin x, \quad \frac{dv}{dx} + u = \cos x$$

given that $x = 0$, when $u = 1$ and $v = 0$. [5]

P.T.O.

Or

2. (*a*) Solve the following DE (any *three*) : [12]

(1) $(D^3 + D)y = \cos x$

(2) $x^2 \frac{d^2y}{dx^2} - 4x \frac{dy}{dx} + 6y = x^5$

(3) $(D^2 + 2D + 1)y = e^{-x} \log x$

(4) $\frac{dx}{3z - 4y} = \frac{dy}{4x - 2z} = \frac{dz}{2y - 3x}$.

(*b*) A body of weight W = 1N suspended from a spring stretches it 4 cm. If the weight is pulled down 8 cm below equilibrium position and then released :

(*i*) Set up a differential equation

(*ii*) Find position and velocity as a function of time. [5]

3. (*a*) Find the Laplace transform of (any *two*) : [6]

(*i*) $\int_0^t e^u u^3 \, du$

(*ii*) $t^2 \sin 2t$

(*iii*) $\frac{1 - e^{-t}}{t}$.

(*b*) Find the Inverse Laplace Transform of (any *two*) : [6]

(*i*) $\tan^{-1} \frac{1}{s}$

(*ii*) $\frac{1}{s^2(s + 1)}$

(*iii*) $\frac{s}{(s - 1)(s - 2)(s - 3)}$.

(*c*) Solve the integral equation :

$$\int_0^\infty f(x) \sin \lambda x \, dx = \begin{cases} 1 - \lambda, & 0 \leq \lambda \leq 1 \\ 0, & \lambda \geq 1. \end{cases}$$ [5]

Or

4. (*a*) Find the Fourier sine transform of $e^{-|x|}$. Hence evaluate

$$\int_0^\infty \frac{x \sin mx}{1 + x^2} dx .$$ [6]

(*b*) Using Fourier Integral representation, show that :

$$\int_0^\infty \frac{1 - \cos \lambda\pi}{\lambda} \sin \lambda x \, d\lambda = \begin{cases} \frac{\pi}{2}, & 0 < x < \pi \\ 0, & x > \lambda. \end{cases}$$ [6]

(*c*) Solve by Laplace Transform method :

$y'' - 3y' + 2y = 12e^{-2t}$, $y(0) = 2$, $y'(0) = 6$. [5]

5. (*a*) Solve $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$, if :

(*i*) u is finite for all t

(*ii*) $u(0, t) = 0$, for all t

(*iii*) $u(l, t) = 0$, for all t

(*iv*) $u(x, 0) = u_0$, for $\leq x \leq l$

l being length of the bar. [8]

(*b*) A string is stretched and fastened to two points '*l*' apart. Motion is started by displacing the string in the form $u = a \sin \frac{\pi x}{l}$ from which it is released at time $t = 0$. Find the displacement $u(x, t)$ from one end. [8]

Or

6. (*a*) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to :

(*i*) $u(x, 0) = 0$

(*ii*) $u(x, l) = 0$

(*iii*) $u(\infty, y) = 0$

(*iv*) $u(0, y) = u_0$. [8]

(*b*) The initial temperature along the length of an infinite bar is given by

$$u(x, 0) = \begin{cases} 2, & |x| < 1 \\ 0, & |x| > 1. \end{cases}$$

If the temperature $u(x, t)$ satisfies the equation :

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, -\infty < x < \infty, \quad t > 0.$$

Find the temperature at any point of the bar at any time. [Use Fourier Transform method]. [8]

SECTION II

7. (*a*) The marks obtained by a class of students in Economics and Statistics. Calculate coefficient of correlation : [6]

Marks in Economics	**Marks in Statistics**
23	25
28	22
42	38
17	21
26	27
35	39
29	24
37	32
16	18
46	44

(*b*) A manufacturer of cotter pins knows that 3% of his product is defective. If he sells cotter pins in boxes of 100 pins will be defective in a box. Find probability that a box will fail to meet the guaranted quality. [5]

(*c*) Find the first four moments about the mean for the data : [6]

Marks	**No. of Students**
0–10	1
10–20	6
20–30	10
30–40	15
40–50	11
50–60	7

8. (*a*) The following runs scored by two Batsman A and B in ten Matches :

A	**B**
30	34
44	46
66	70
62	38
60	55
34	48
80	60
46	34
20	45
38	30

Determine, who is more consistent ? [6]

(*b*) In a test on 2000 electric bulbs it was found that the life of a particular make was normally distributed with an average time 2040 hours and S.D. of 60 hours. Estimate the number of bulbs likely burn for more than 1920 hours but less than 2160 hrs.

(Given : $z = 2$, Area = 0.4772). [6]

(*c*) The number of Computer Books borrowed from a library during a particular week is given below :

Days	**No. of Books**
Mon.	140
Tues.	132
Wed.	160
Thur.	148
Fri.	134
Sat.	150

Test the hypothesis that the no. of books borrowed does not depend on the day of week. (Given : $\chi^2_{0.05} = (11.07)$. [5]

9. (*a*) Show that tangent at any point on the curve $x = e^t \cos t$, $y = e^t \sin t$, $z = e^t$ at $t = 0$ makes constant angle with z-axis. [5]

(*b*) Find the directional derivative of $\phi = xy^2 + yz^3$ at $(1, -1, 1)$ in the direction normal to the surface $x^2 + y^2 + z^2 = 9$ at $(1, 2, 2)$. [5]

(*c*) Prove that (any *two*) : [6]

(*i*) $\nabla^2 \left\{ \nabla \cdot \frac{\bar{r}}{r^2} \right\} = \frac{2}{4}$

(*ii*) $\nabla \left(\frac{\bar{a} \times \bar{r}}{r^n} \right) = \frac{(2 - n)\bar{a}}{r^n} + \frac{n(\bar{a} \cdot \bar{r})}{r^{n+2}} \bar{r}$

(*iii*) $\nabla[\bar{a} \cdot (\bar{r} \times \bar{b})] = \bar{b} \times \bar{a}$.

Or

10. (*a*) Show that :

$\bar{F} = (y \sin z - \sin x)\bar{i} + (x \sin z + 2yz)\bar{j} + (xy \cos z + y^2)\bar{k}$

is irrotational. Also find scalar point function 'ϕ' such that $\bar{F} = \nabla\phi$. [5]

(*b*) Show that $f(r)\bar{r}$ is irrotational. Determine $f(r)$ such that the field is solenoidal. [6]

(*c*) If the directional derivative of $\phi = axy + byz + czx$ at (1, 1, 1) has the magnitude 4 in the direction parallel to x-axis. Find the values of a, b, c. [5]

11. (*a*) Evaluate $\int_C \bar{F} \cdot d\bar{r}$

for $\bar{F} = 3x^2\bar{i} + (2xz - y)\bar{j} + z\bar{k}$

along the curve $\bar{r} = t^2\bar{i} + 2t\bar{j} + (2t^2 - 1)\bar{k}$ from $t = 0$ to $t = 1$. [5]

(*b*) By using Green's theorem, evaluate

$\int_C \bar{F} \cdot d\bar{r}$ for $\bar{F} = (\sin y - y^3)\bar{i} + (xy^2 + x \cos y)\bar{j}$

where 'C' is circle $x^2 + y^2 = a^2$. [6]

(*c*) Use divergence theorem to evaluate $\iint_S \bar{F} \cdot d\bar{s}$, where S is the surface of cone $z^2 = x^2 + y^2$ above X o Y plane and bounded by the plane $z = 4$, where $\bar{F} = 4zx\bar{i} + xyz^2\bar{j} + 3z\bar{k}$. [6]

Or

12. (*a*) Verify Stokes' theorem for the field :

$$\bar{F} = (2x - y)\bar{i} - yz^2\bar{j} - y^2z\bar{k}$$

over the surface of hemisphere $x^2 + y^2 + z^2 = 1$ above X o Y plane. [6]

(*b*) Evaluate $\iint_S \bar{F} \cdot d\bar{s}$

for $\bar{F} = 4x\bar{i} - 2y^2\bar{j} + z^2\bar{k}$

and S is the surface of cylinder $x^2 + y^2 = 4$, $z = 0$, $z = 3$. [6]

(*c*) Find the work done in moving a particle once round the ellipse $\frac{x^2}{16} + \frac{y^2}{4} = 1$, $z = 0$ under the force field

$$\bar{F} = (2x - y + z)\bar{i} + (x + y - z^2)\bar{j} + (3x - 2y + 4z)\bar{k}.$$ [5]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-112

S.E. (Automobile/Mechanical Engineering)

(First Semester) EXAMINATION, 2015

APPLIED THERMODYNAMICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Assume suitable data, if necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Answers to the two Sections should be written in separate answer-books.

(*v*) Answer *three* questions from Section I and *three* questions from Section II.

(*vi*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

Section I

Unit I

1. (*a*) Show that coefficient of performance of heat pump and refrigerator can be related as : $(COP)_{Ref} = (COP)_{Heat\ Pump} - 1$. [8]

(*b*) Write Clausius statement and Kelvin-Planck statement. [8]

P.T.O.

Or

2. (*a*) Show the equivalence of two statements of second law of thermodynamics. [8]

(*b*) Define the 'entropy'. Also explain how it is a measure of irreversibility. [8]

Unit II

3. (*a*) Describe the Helmholtz function. [8]

(*b*) Two tanks A and B contain 1 kg of air at 1 bar, 50°C and 3 bar, 50°C when atmosphere is at 1 bar, 15°C. Identify the tank in which stored energy is more. Also find the availability of air in each tank. [10]

Or

4. (*a*) Define availability. Obtain an expression for availability of closed system. [8]

(*b*) Cylindrical vessel of 1 m diameter and 4 m length has hydrogen gas at pressure of 100 kPa and 27°C. Determine the amount of heat to be supplied so as to increase gas pressure to 125 kPa. [10]

For hydrogen take C_p = 14.307 kJ/kg.K, C_v = 10.183 kJ/kg K.

Unit III

5. (*a*) What is pure substance ? Draw and explain p-V diagram for water. [8]

(*b*) Write short notes on the following : [8]

(*i*) Sensible heating

(*ii*) Latent heating

(*iii*) Critical point

(*iv*) Triple point

Or

6. (*a*) What are the reasons due to which Carnot cycle is not used as an ideal cycle for vapour power plant ? [8]

(*b*) Explain the following terms : [8]

(*i*) Wet steam

(*ii*) Dry steam

(*iii*) Superheated steam

(*iv*) Dryness fraction of a steam

Section II

Unit IV

7. (*a*) Describe proximate analysis and ultimate analysis and their relevance. [8]

(*b*) Coal having the following composition by mass is burnt with theoretically correct amount of air : [8]

86% C, 6% H, 5% O, 2% N, 1% S. Determine the air-fuel ratio.

Or

8. (*a*) Explain Orsat gas apparatus method of gas analysis in brief. [8]

(*b*) Determine the higher and lower calorific values of coal for which the following observations are made in bomb calorimeter : [8]

Mass of coal sample = 1 gm

Mass of water in bomb calorimeter = 2.5 kg

Initial temperature of water = 20°C

Maximum recorded temperature of water = 22.6°C

Water equivalent of apparatus = 750 gm

Cooling correction = + 0.018°C

Consider coal to have 5% H_2 in it.

Unit V

9. (*a*) Draw P-v and T-s diagram for Isothermal, polytrophic and isentropic works and compare the three works. Write down equation of the work for three cases. [8]

(*b*) During an experiment on reciprocating air compressor the following observations are being taken : [8]

Barometer reading = 75.6 cm Hg;

Manometer reading across orifice = 13 cm Hg.

Atmospheric temperature = 25°C

Diameter of orifice = 15 mm

Coefficient of discharge across the orifice = 0.65

Take density of Hg = 0.0135951 kg/cm^3

Determine the volume of free air handled by compressor in m^3/min.

Or

10. (*a*) What are the advantages of multi-staging in reciprocating air compressor ? [8]

(*b*) A single cylinder air compressor delivers 9 kg of air per minute. The air is compressed from 1 bar and 27 deg. C to 7 bar. The compression process follows the law $PV^{1.25} = C$. Find work done and brake power required if mechanical efficiency is 85%. [8]

Unit VI

11. (*a*) Write a note on boiler mountings and accessories. [8]

(*b*) Steam is generated in a boiler at 30 bar 300°C at the rate of 11 kg/s with feed water entering economizer at 100°C. During one hour test 5000 kg fuel is used in boiler. Calorific value of fuel is 35000 kJ/kg. For the feed water being supplied to boiler to be at 27°C determine : [10]

(*i*) the equivalent evaporation per kg of fuel

(*ii*) the boiler efficiency

(*iii*) the percentage of fuel energy utilized in economizer

Or

12. (*a*) Write notes on : [8]

(*i*) Equivalent evaporation

(*ii*) Boiler efficiency.

(*b*) A boiler is being tested for 24 hours and during this trial steam at average pressure of 10 bar, dry saturated is produced from 15 ton of water consuming 1.5 ton of coal. Composition of coal has 3% moisture and 4% ash. Feed water is added at 35ºC. Determine : [10]

(*i*) the boiler efficiency,

(*ii*) the equivalent evaporation per kg of dry coal, and

(*iii*) the equivalent evaporation per kg of combustible present in coal.

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-113

S.E. (Mechanical/Automobile/Mechanical S/W) (First Semester)

EXAMINATION, 2015

METALLURGY–I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Draw the neat sketch whenever necessary.

SECTION I

1. (*a*) What is recrystallization ? Explain the factors affecting recrystallization process. [4]

(*b*) Explain the phenomenon of strain hardening in detail. [4]

P.T.O.

(*c*) Represent the following planes and directions in cubic system (any *two*) : [4]

(*i*) [112]

(*ii*) (111)

(*iii*) (221).

(*d*) What is the role of dislocation in the plastic deformation of metal ? [4]

Or

2. (*a*) Differentiate between the following (any *one*) : [4]

(*i*) Slip and Twinning

(*ii*) Hot and cold working.

(*b*) Derive the equation for critical resolve shear stress during slip in a single crystal. [4]

(*c*) How plastic deformation in polycrystalline material is different from single crystal ? [4]

(*d*) Explain the phenomenon of strain hardening with the curve. [4]

3. (*a*) What is creep ? In which applications should it be considered ? How is the creep resistance improved ? [4]

(*b*) Define the following : [4]

(*i*) Modulus of toughness

(*ii*) Ductility

(*iii*) Yielding

(*iv*) Modulus of resilience.

(*c*) Define fatigue limit. Explain the processes used to improve fatigue life. [4]

(*d*) Vickers Hardness Test with reference to load, indenter, formula and application. [4]

Or

4. (*a*) Draw the standard IS specimen for Charpy and Izod impact tests. [4]

(*b*) Why are impact test specimens notched ? What is the effect of temperature on impact strength ? [4]

(*c*) Obtain the relationship between engineering stress, strain and true stress, strain. [4]

(*d*) With a neat sketch explain the procedure for Rockwell hardness test. [4]

5. (*a*) Draw neatly labeled Fe-Fe_3C diagram and explain the three reactions associated with it. [6]

(*b*) Draw and label microstructures of hypoeutectoid steel, eutectoid steel and hypereutectoid steel. [6]

(*c*) What are the types of stainless steels ? Explain about weld decay in stainless steels. [6]

Or

6. (*a*) Enlist all the types of cast iron and give *two* applications of each type. Explain the manufacturing of *one* of them. [6]

(*b*) What is critical temperature ? What do you understand by A_0, A_1, A_2, A_3 and A_{cm} ? [6]

(*c*) Classify the steels on the basis of : [6]

(*i*) Carbon percentages

(*ii*) Degree of deoxidation

(*iii*) Depth of hardening.

SECTION II

7. (*a*) What are the advantages and limitations or disadvantages of nitriding over carburising ? [6]

(*b*) Write a detailed note on : "Transformation Products of Austenite". [6]

(*c*) Draw TTT diagram and show the following heat treatment cycles on it : [6]

(*i*) Martempering

(*ii*) Austempering

(*iii*) Hardening.

Or

8. (*a*) What is Tempering ? Is it mandatory ? With a suitable graph, explain the variations in properties with tempering temperature. [6]

(*b*) Why is carburizing performed at higher temperature and nitriding at lower temperature ? [6]

(*c*) What is hardenability ? Explain any *one* method of envaluating it. Discuss the factors influencing hardenability. [6]

9. (*a*) Explain the automization process of powder manufacturing with neat sketch. [4]

(*b*) Is sintering mandatory in P/M technique ? Justify in brief. [4]

(*c*) List the powder production processes and explain any *one* of them. [4]

(*d*) Enlist the properties required for the material to be bearing material. Write brief note on Babbitts. [4]

Or

10. (*a*) Enlist the types of brasses. Explain any *one*. [4]

(*b*) Give composition, properties and application of the following metals : [4]

(*i*) Gun metal

(*ii*) Muntz metal.

(*c*) What are the advantages and limitations of Powder Metallurgy Process ? [4]

(*d*) Write short note : Electrical contact materials. [4]

11. (*a*) Write short note on Shape Memory Alloys. [4]

(*b*) Write short note on : Ferrites. [4]

(*c*) Write short note on : Cryogenic materials. [4]

(*d*) Explain with suitable example Nano materials. [4]

Or

12. (*a*) Hybrid and non-hybrid composites. [4]

(*b*) Write a note on dispersion strengthened composites and state the applications. [4]

(*c*) Explain the effects of cryogenic temperature on mechanical properties of materials. [4]

(*d*) Explain different types of biomaterials. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-115

S.E. (Mechanical, Mech. Sand., Automobile, Production, Prod. Sand.) (Second Semester) EXAMINATION, 2015

ELECTRICAL TECHNOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-book.

(*iii*) Figures to the right indicate full marks.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Use of non-programmable scientific calculator is allowed.

(*vi*) Assume suitable data wherever necessary and state the same clearly.

SECTION I

1. (*a*) Discuss one wattmeter method for measurement of reactive power in a three-phase balanced load with the help of connection diagram and phasor diagram. [6]

P.T.O.

(*b*) State advantages of good power factor in electrical systems. Hence mention methods of improving power factor. [6]

(*c*) A 3-phase motor load has a power factor of 0.397 lagging. Two wattmeters connected to measure power provide the total input as 30 kW. Find the reading on each wattmeter. [6]

Or

2. (*a*) Explain single-phase energy measurement using CT and PT with the help of connection diagram. [6]

(*b*) Explain in brief the requirements of good lighting scheme. State any *two* examples of special purpose lighting. [6]

(*c*) Two wattmeters are used to measure power in a 3-phase balanced load. The wattmeter readings are 8.2 kW and 7.5 kW respectively. Calculate :

(*i*) Total power

(*ii*) Power factor

(*iii*) Total reactive power. [6]

3. (*a*) Discuss the typical layout of distribution transformer substation with the help of single line diagram. [8]

(*b*) Derive an expression for torque developed in a three-phase induction motor under running conditions. Hence obtain the condition for maximum torque. [8]

Or

4. (*a*) Discuss three-phase transformer connections with the help of suitable diagrams. State possible applications of transformers based on these connections. [8]

(*b*) The power input to a 500 V, 50 Hz, 6-pole, 3-phase induction motor running at 975 rpm is 40 kW. The stator losses are 1 kW and the friction and windage losses are 2 kW. Calculate :

(*i*) Slip

(*ii*) Rotor copper loss

(*iii*) Shaft power

(*iv*) Efficiency of motor. [8]

5. (*a*) Distinguish between salient pole and non-salient pole type of synchronous generators. Write specifications of these generators. [8]

(*b*) Why is a single-phase induction motor not self-starting ? Explain the working principle and construction of a split phase induction motor. [8]

Or

6. (*a*) Explain the construction and working of a shaded pole induction motor with the help of neat diagrams. Mention its typical specifications. [8]

(*b*) Find the synchronous impedance and reactance of a single-phase alternator in which a given field current produces an armature current of 200 A on short circuit and a generated e.m.f. of 50 V on open circuit. The armature resistance is 0.1 ohm. To what induced voltage must the alternator be excited if it is to deliver a load of 100 A at a power factor of 0.8 lagging with a terminal voltage of 200 V. [8]

SECTION II

7. (*a*) What is a servomotor ? Explain construction and working of D.C. servomotor. Write its any *four* applications. [8]

(*b*) State and explain any *two* methods for controlling the speed of a D.C. shunt motor. Also mention merits and demerits of these methods. [8]

Or

8. (*a*) Explain construction and working of universal motor. State its any *two* applications. [8]

(*b*) A D.C. series motor runs at 800 rpm with a line current of 100 A from 230 V mains. Its armature circuit resistance is 0.15 Ω and field resistance is 0.1 Ω. Find the speed at which the motor runs at a line current of 25 A, assuming the flux at this current is 45% of flux at 100 A. [8]

9. (*a*) State methods to turn ON SCR. Draw and explain V-I characteristics of SCR. [8]

(*b*) Explain construction and working of enhancement type MOSFET with the help of suitable diagrams. Draw its output characteristics. [8]

Or

10. (*a*) Draw and explain V-I characteristics of DIAC and TRIAC. [8]

(*b*) Explain construction and working of GTO. Draw its characteristic curve and hence state its any *two* applications. [8]

11. (*a*) Describe the various types of chopper configurations in brief with the help of appropriate diagrams. [8]

(*b*) State and explain factors for selection of electrical motors based on various load characteristics in industrial applications. Quote any *five* applications and state the suitable type of motor selected for these. [10]

Or

12. (*a*) Explain V/f control of three-phase induction motors. State *two* applications employing this method of control. [8]

(*b*) What is a drive ? Discuss features of individual and group drives. Elaborate advantages of electrical drives. [10]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-116

S.E. (Mechanical/Automobile) (First Semester) EXAMINATION, 2015

MANUFACTURING PROCESSES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Solve Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I, Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Use of non-programmable electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain investment casting along with advantages and limitations. [8]

(*b*) Explain shell moulding. State the advantages and limitations of the process. [8]

P.T.O.

Or

2. (*a*) Sketch and explain different types of patterns. [8]

(*b*) Explain the construction and working of hot chamber die casting process. State the advantages and limitations of the process. [8]

3. (*a*) Explain the different types of forging defects with reference to causes and remedies. [8]

(*b*) Sketch and explain types of rolling mills. [8]

Or

4. (*a*) Describe with neat sketches the operation of wire drawing and tube drawing. [8]

(*b*) With sketch explain hot spinning process. Advantages and limitations. [8]

5. (*a*) With neat diagram, explain resistance welding process. State types, advantages and limitations of the process. [10]

(*b*) Sketch and explain different types of flames used in gas welding. [8]

Or

6. (*a*) Compare brazing, soldering and braze welding processes. [10]

(*b*) With sketch explain Submerged Arc welding process. State advantages and limitations. [8]

SECTION II

7. (*a*) Explain all geared headstock of lathe with sketch. State advantages and limitations. [8]

(*b*) Explain with diagram four lathe accessories. [10]

Or

8. (*a*) Explain with diagram simple gear train and compound gear train. [8]

(*b*) Calculate the machining time required for 3 passes while reducing 65 mm diameter shaft to 55 mm diameter for a length of 1200 mm with depth of cut of 2 mm for rough cut and 1 mm for finish cut. [10]

Given :

(*i*) Cutting speed = 25 m/min

(*ii*) Feed = 0.5 mm/rev

(*iii*) Approach length = 5 mm

(*iv*) Overrun length = 5 mm

(*v*) Number of passes = 3 (2 rough cut + 1 finish cut)

9. (*a*) State types of Milling machines and explain any *one* with sketch. [8]

(*b*) Explain with diagram Universal dividing head. [8]

Or

10. (*a*) Explain with diagram four drilling machine operations. [8]

(*b*) Calculate the speed and machining time required for producing 10 hole on an M.S. plate of 18 mm thickness with the following data : [8]

(*i*) Drill diameter = 20 mm

(*ii*) Cutting speed = 25 m/min

(*iii*) Feed = 0.15 mm/rev.

11. (*a*) Explain procedure of mounting grinding wheel. [8]

(*b*) Outline various factors that influence the selection of grinding wheel. Explain the meaning of any *four* letters mentioned in the specification printed on a grinding wheel. [8[

Or

12. (*a*) Explain the process of Thread grinding. [8]

(*b*) Distinguish between honing an lapping process with sketch. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-117

S.E. (Mech/Automobile) (Second Semester) EXAMINATION, 2015

IC ENGINE

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Compare Otto and Dual cycle for : [8]

(*i*) Constant maximum pressure and same heat input

(*ii*) Same compression ration and same heat input.

(*b*) In an ideal diesel cycle, the pressure and temperature are 1.03 bar and 27°C respectively. The maximum pressure in the cycle

P.T.O.

is 47 bar and the heat supplied during cycle is 545 kJ/kg. Determine :

(*i*) Compression ration.

(*ii*) The temperature at the end of compression.

(*iii*) The temperature at the end of constant pressure combustion

(*iv*) Air standard efficiency.

Assume r = 1.4, C_p = 1.004 J/kg-K for air [10]

Or

2. (*a*) Explain in brief how chemical equilibrium affects the performance of the engine. [6]

(*b*) Draw theoretical and actual valve timing diagram for four stroke petrol engine. Explain the reason for difference. [6]

(*c*) Explain pumping and friction losses and their effects on the power output of the engine. [6]

3. (*a*) Explain the phenomenon of pre-ignition. How pre-ignition leads to detonation and vice-versa ? Explain how pre-ignition can be detected. [8]

(*b*) Explain with neat sketch the following system of carburetor : [8]

(*i*) Idling system

(*ii*) Chock

Or

4. (*a*) Explain any *two* types of combustion chamber used in SI engines. [8]

(*b*) What are advantages and disadvantages of petrol injection system over conventional carburetor system. [4]

(*c*) Explain why rich mixture is required for : [4]

(*i*) Idling

(*ii*) Sudden acceleration.

5. (*a*) What are functional requirement of injection system ? [8]

(*b*) Explain with sketch the following type of injection system :

(*i*) Common rail system.

(*ii*) Unit injection system. [8]

Or

6. (*a*) Explain stage of combustion in CI engine. [8]

(*b*) Write short notes on the following : [8]

(*i*) Supercharging

(*ii*) Turbo charging.

SECTION II

7. (*a*) What are basic requirements of ideal ignition system ? [4]

(*b*) What are main functions of lubricating system ? Explain dry sump lubrication system. [8]

(*c*) Write short note on additives used in lubricating system. [4]

Or

8. (*a*) Define intake manifold and their functions. State material used. Discuss the requirement for design of intake manifold. [8]

(*b*) Explain working of spring loaded mechanical governor with the help of neat sketch used for diesel engine. [8]

9. (*a*) What is dynamometer ? Name various type of dynamometer. Explain Prony type of dynamometer with the help of neat sketch. [10]

(*b*) Write short notes on : [8]

(*i*) Heat balance sheet

(*ii*) Various factors affecting volumetric efficiency.

Or

10. (*a*) A six cylinder gasoline engine operate on four stroke cycle. The bore of each cylinder is 80 mm and stroke 100 mm. The clearance volume per cylinder is 70 CC. At a speed of 4000 r.p.m., the fuel consumption is 30 kg/hr and the torque developed is 150 Nm.

Calculate :

(*i*) The brake power

(*ii*) The brake mean effective pressure

(*iii*) The brake mean thermal efficiency.

Assume CV of fuel = 43,000 kJ/kg.

Also estimate relative efficiency when engine works on constant volume cycle with = 1.4 for air. [12]

(*b*) Compare battery ignition and magneto-ignition system. [6]

11. (*a*) Enlist the specification of an automobile engine. [6]

(*b*) Discuss various types of exhaust emission from automobile. Which of these are harmful ? [6]

(*c*) Mention the modification required if hydrogen is used in SI engine as a substitute fuel. [4]

Or

12. Write short notes on : [16]

(*i*) MPFI

(*ii*) DTSi

(*iii*) Bharat Norms

(*iv*) Fuel-Air Equivalence ration.

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+1**

Seat No.	

[4757]-118

S.E. (Mechanical/Automobile) (Second Semester) EXAMINATION, 2015

STRENGTH OF MACHINE ELEMENTS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw and explain typical stress strain diagram for ductile materials indicating all the salient points. [6]

(*b*) Define and explain the following terms : [6]

(*i*) Modulus of Elasticity

P.T.O.

(*ii*) Factor of safety

(*iii*) Thermal stress.

(*c*) A wooden tie is 60 mm wide, 120 mm deep and 1.5 m long. It is subjected to an axial pull of 30 kN. The stretch of the member is found to be 0.625 mm. Find the Young's Modulus for the tie material. [6]

Or

2. (*a*) Define and explain the following terms : [6]

(*i*) Hooke's Law

(*ii*) Poisson's Ratio

(*iii*) Bulk Modulus.

(*b*) Show that in a bar subjected to an axial load, the instantaneous stress due to sudden application of load is twice the stress caused by gradual application of load. [6]

$$\Sigma = 2\left(\frac{P}{A}\right).$$

(*c*) A rod of steel is 20 m long at a temperature of 20°C. Find the free expansion of the rod, when the temperature is raised to 65°C. Find the temperature stress produced : [6]

(*i*) When the expansion of the rod is prevented.

(*ii*) When the rod is permitted to expand by 5.8 mm.

Take $\alpha = 12 \times 10^{-6}$ per °C and $E = 2 \times 10^5$ N/mm^2.

3. (*a*) Derive the following equation of bending moment with usual notations and further write the relations of shear force and rate of loading. [6]

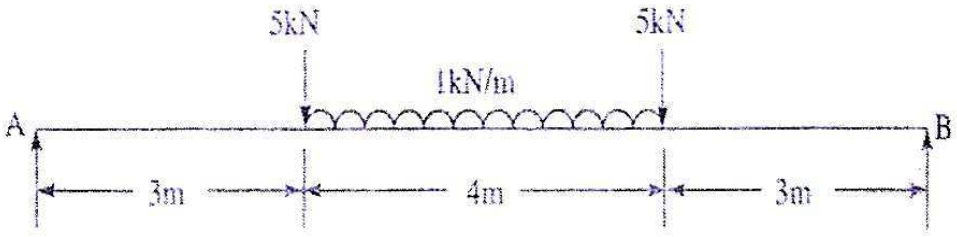
$$E.I.\left(\frac{d^2y}{dx^2}\right) = M .$$

(*b*) A beam is 10 m long and is simply supported at its ends. It carries concentrated loads of 100 kN and 60 kN at distances of 2 m and 5 m respectively from the left end. Calculate deflection under each load. Find also the maximum deflection.

Take I = 18×10^8 mm^4 and E = 200 kN/mm^2. [10]

Or

4. (*a*) A beam AB 10 m long has supports at its end A and B. It carries a load of 5 kN at 3 m from A and a point load of 5 kN at 7 m from A and a udl of 1 kN/m between the point loads. Draw SF and BM diagrams for the beam. [12]



(*b*) Explain the following terms : [4]

(*i*) Point of contraflexure

(*ii*) Slope and deflection.

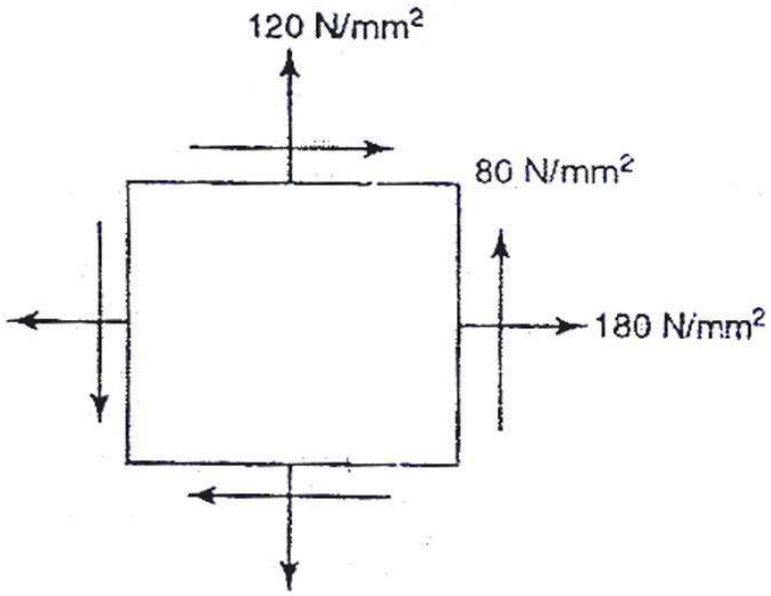
5. (*a*) The state of stress at a point in a strained material is as shown in following fig. Determine : [8]

(*i*) The direction of principal planes

(*ii*) The magnitude of principal stresses

(*iii*) The magnitude of maximum shear stress and its direction.

Use Mohr's circle method.



(*b*) A solid circular shaft is subjected to a bending moment of 40 kNm and a torque of 10 kNm. Determine the diameter of the shaft according to : [8]

(*i*) Maximum principal stress theory

(*ii*) Maximum shear stress theory.

Take $\mu = 0.25$; stress at elastic limit = 200 N/mm^2 and factor of safety = 2.

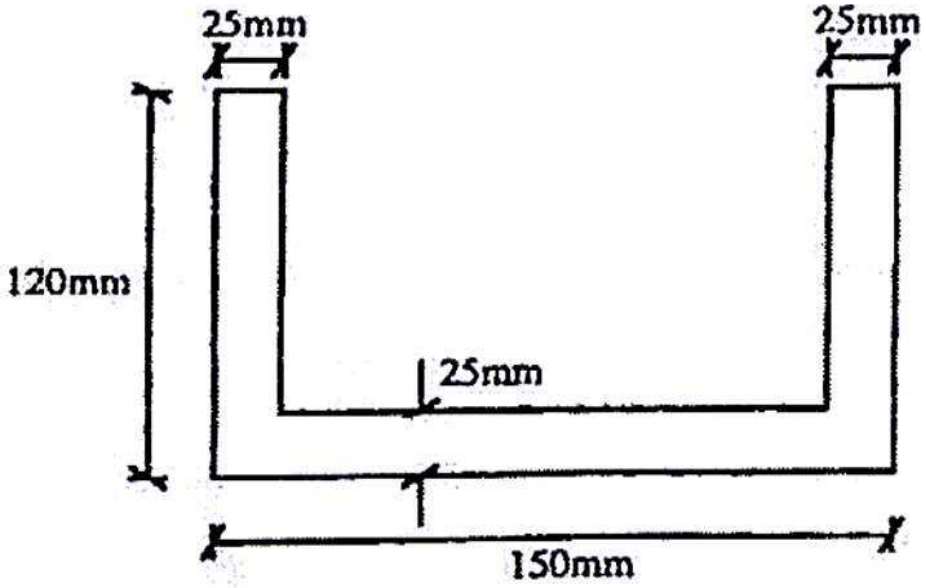
Or

6. (*a*) What are the various theories of failure ? Explain maximum principal stress theory and maximum shear stress theory. [8]

(*b*) The principal stresses at a point in a bar are 200 N/mm^2 (tensile) and 100 N/mm^2 (comp). Determine the resultant stress in magnitude and direction on a plane inclined at 60° to the axis of the major principal plane. Also determine the maximum intensity of shear stress in the material at the point. [8]

SECTION II

7. (*a*) A horizontal beam of section 3 m long and is simply supported at its ends. Find the maximum udl it can carry, if the compressive and tensile stress must not exceed 55 N/mm^2 and 30 N/mm^2 respectively. Draw bending stress distribution diagram. [10]



(*b*) Show the shear stress variation in the following sections : [6]

(*i*) Rectangle

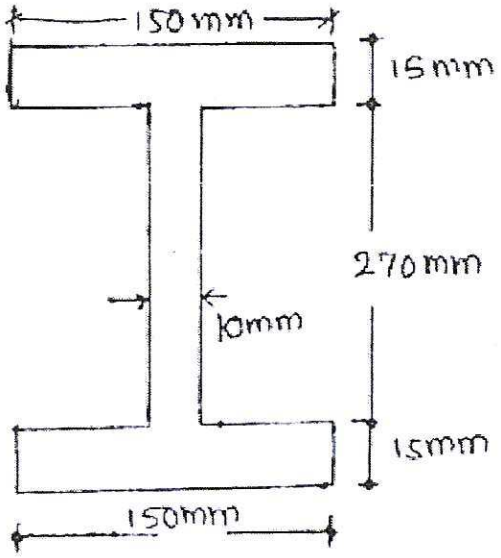
(*ii*) Hollow circle

(*iii*) I section

(*iv*) Triangle.

Or

8. (*a*) Draw shear stress distribution diagram for beam as shown. The section is subjected to S.F. of 150 kN. [8]



(*b*) Consider the beam subjected to pure bending by bending moment M and radius of curvature of neutral layer is R, moment of inertia is I and modulus of elasticity E. Derive an equation for magnitude of bending moment M in terms of E,I,R. [8]

9. (*a*) Compare the weights of equal lengths of hollow and solid shaft to resist same torsional moment for same maximum stress. Assume internal diameter 0.75 times the external diameter for hollow shaft. [8]

(*b*) Compare the crippling load given by Euler's and Rankine's formula for a tubular steel strut 2.3 m long having external diameter 38 mm and internal diameter 33 mm. Strut is fixed at one end and hinged at other end. Yield stress for steel 335 MPa, E = 205 GPa, a = 1/7500. [8]

Or

10. (*a*) Derive Euler's formula for buckling load for column with hinged ends. Also state the limitations of Euler's formula. [8]

(*b*) A hollow shaft has 60 mm external diameter and 50 mm internal diameter : [8]

(*i*) Determine the twisting moment it can resist if permissible shear stress is 100 MPa.

(*ii*) Determine the diameter of solid circular shaft made of the same material which can transmit same twisting moment.

(*iii*) Compare their weights per meter length.

Take G = 80 GPa.

11. (*a*) Explain the various steps in the process of designing machine components. [6]

(*b*) A knuckle joint is subjected to an axial load of 70 kN. It is made of plain carbon steel with ultimate strength in tension 420 N/mm^2. The shearing strength of material is 396 N/mm^2. Take FOS as 6. [12]

Or

12. (*a*) Explain briefly the requisites of Design Engineer. [4]

(*b*) Explain the term 'Design for Environment'. [4]

(*c*) Design a cotter joint to transmit a load of 90 kN in tension or compression. Assume the following stress for socket, spigot and cotter : [10]

Allowable tensile stress = 90 MPa

Allowable crushing stress = 120 MPa

Allowable shear stress = 60 MPa.

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+1**

Seat No.	

[4757]-119

S.E. (Mech. Sand./Automobile) (Second Semester)

EXAMINATION, 2015

THEORY OF MACHINES–I

(2008 PATTERN)

Time : Four Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-book.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

UNIT I

1. (*a*) Explain with neat sketches 'Pantograph'. [4]

(*b*) What is the condition for correct steering ? Explain with neat sketch Davis steering gear mechanism. [6]

(*c*) Write a short note on Whitworth quick return mechanism. [6]

P.T.O.

Or

2. (*a*) Explain the following terms with suitable examples : [6]

(*i*) Completely constrained motion

(*ii*) Incompletely constrained motion

(*iii*) Successfully constrained motion.

(*b*) Classify kinematic pairs with suitable example. [6]

(*c*) Write a note on Hooke's joint and its applications. [4]

UNIT II

3. (*a*) For the configuration as shown in Fig. 1, determine velocity of D by instantaneous center method, if velocity of A is 635 mm/sec and link O_2A rotates in anticlockwise direction. [12]

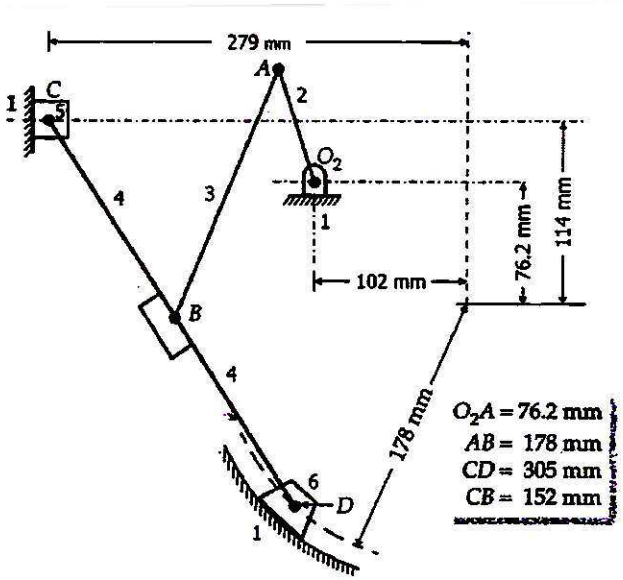


Fig. 1

(*b*) With the help of neat sketch, explain the concept of 'Velocity Image Principle'. [4]

Or

4. (*a*) Determine acceleration of slider D and angular acceleration of link CD for the mechanism shown in Fig. 2.

Crank OA rotates uniformly with 180 rpm in clockwise direction. Various link lengths are OA = 150 mm; AB = 450 mm; PB = 240 mm; BC = 210 mm; CD = 660 mm. [14]

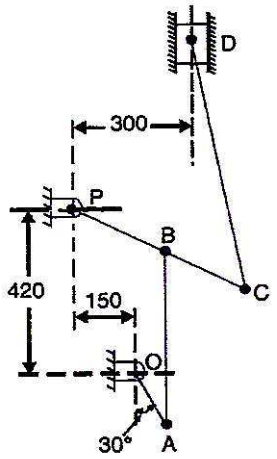


Fig. 2

(*b*) Write a note on Body Centrodes. [2]

UNIT III

5. In a mechanism as shown in Fig. 3, the crank OA is 100 mm long and rotates clockwise about O at 120 rpm. The connecting rod AB is 400 mm long. At a point C on AB, 150 mm from A, the rod CE 350 mm long is attached. The rod CE slides in a slot in a trunnion at D. The end E is connected by a link EF, 300 mm long to the horizontally moving slider F. For the mechanism in the position shown, find : [18]

(*i*) Velocity of F

(*ii*) Velocity of sliding of CE in the trunnion and

(*iii*) Angular velocity of CE.

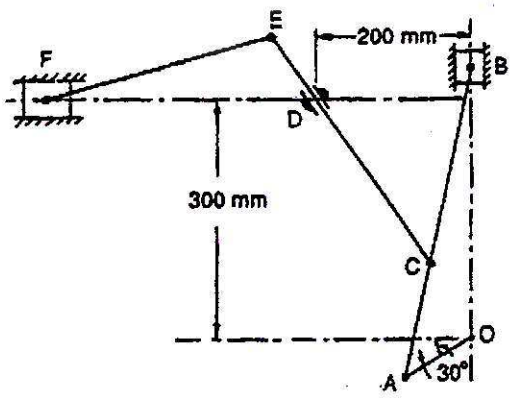


Fig. 3

Or

6. (*a*) In a Whitworth quick return motion as shown in Fig. 4, OA is a crank rotating at 30 rpm in a clockwise direction. The dimensions of various links are : [12]

OA = 150 mm, OC = 100 mm, CD = 125 mm

and DR = 500 mm.

Determine the acceleration of sliding block R and the angular acceleration of the slotted lever CB.

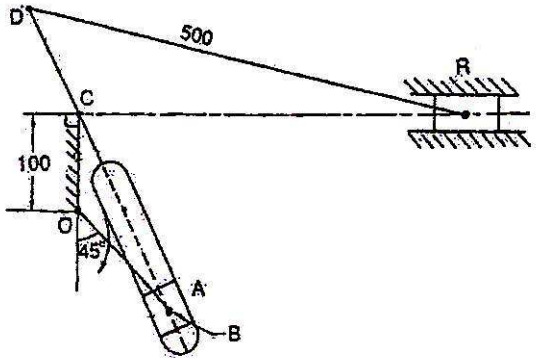


Fig. 4

(*b*) Give Kleins construction for determining the acceleration of piston of a reciprocating engine, when the crank is rotating with non-uniform velocity. [6]

SECTION II

UNIT IV

7. (*a*) In a slider crank mechanism, the crank is 200 mm and the connecting rod length is 800 mm. Find analytically the velocity and acceleration of piston and angular velocity and angular acceleration of connecting rod when the crank is turned through 60° from the inner dead centre. The angular velocity of the crank is 20 rad/sec and is increasing at the rate of 10 rad/sec^2. [8]

(*b*) Angle between two shafts connected by a Hooke's joint is 25°. If the driving shaft is rotating at 1000 rpm, find out :

(*i*) Minimum speed of driven shaft in rpm.

(*ii*) Maximum speed of driven shaft in rpm.

(*iii*) The driving shaft rotation angles at which driven and driving shaft speeds are same. Also draw schematic polar diagram for the above Hooke's joint indicating all important values. [8]

Or

8. (*a*) The driving shaft of Hooke's joints runs at a uniform speed of 240 rpm and the angle between the shafts is 20°. The driven shaft with attached masses of 55 kg at a radius of gyration of 150 mm. If a steady torque of 200 Nm resists rotation of the driven shaft, find the torque required at the driving shaft when angle turned through by the driving shaft is 45°. At what angle between the shafts will the total fluctuation of speed of the driven shaft be limited to 24 rpm ? [10]

(*b*) The four bar mechanism as shown in Fig. 5, which is driven by link 2 at 45 rad/sec, counterclockwise. Find the angular velocity of link 3 and 4 using complex number method : [6]

AB = 100 mm

CD = 300 mm

AD = 250 mm

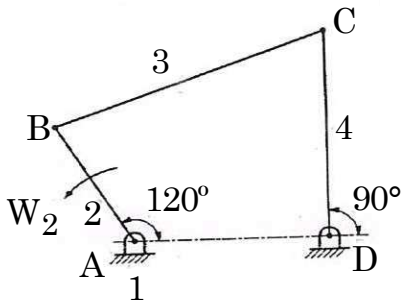


Fig. 5

UNIT V

9. (*a*) Explain Relative Pole method for graphical synthesis. [6]

(*b*) Determine Chebyshev spacing for function $y = 2x^3 - x$ for the range $0 \leq x \leq 4$, where four precision points are required. For these precision points, determine corresponding values of x, y, θ and φ. Take $\Delta\theta = 60^o$ and $\Delta\varphi = 90^o$. [12]

Or

10. (*a*) Synthesize a four bar mechanism to generate a function $y = 2X^{1.5} + 3$ for the range $0 \leq x \leq 3$. Assuming 50^o starting and 130^o finishing position for input link as well as for output link, determine corresponding values of x, y, θ and φ using three precision positions. Assume grounded link is horizontal and its length is 100 mm and crank length is 40 mm. Ground pivot of input link is on left side and ground pivot of output link is on right side. Draw the mechanism in its first precision position. Use method of inversion. [16]

(*b*) Write a note on structural error. [2]

UNIT VI

11. (*a*) Explain Dynamically Equivalent System and Correction couple. [8]

(*b*) Derive the expression for the natural frequency of "Compound Pendulum". [8]

Or

12. (*a*) With the help of a neat diagram, derive the expression for the natural frequency of "Trifilar Suspension". [8]

(*b*) The connecting rod of an engine has a length equal to 200 mm between centre end has a mass equal to 2.5 kg. Its centre of gravity is at 80 mm from the big end, and the radius of gyration about an axis through the centre of gravity perpendicular to the plane of motion is 100 mm.

Find :

(*i*) The two mass dynamically equivalent system when one mass is placed at the small end.

(*ii*) The correction couple, if the two masses are placed at the two ends and the angular acceleration of the connecting rod is 100 rad/sec^2 clockwise. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-120

S.E. (Mech./Auto.) (Second Semester) EXAMINATION, 2015

PRODUCTION TECHNOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each section.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Neat diagrams must be drawn whenever necessary.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) A tool with 18^{o} rake angle is making an orthogonal cut, 3 mm wide, at a speed of 31 rpm and feed of 0.25 mm. The chip thickness ratio is 0.55 cutting force is 1392 N and feed force as 363 N. Find : [10]

(*i*) Chip thickness

P.T.O.

(*ii*) Shear plane angle

(*iii*) Coefficient of friction on tool force

(*iv*) Shear force on shear plane

(*v*) Energy consumes in kW min/cm^3.

(*b*) State the factors which affect tool life. [6]

Or

2. (*a*) The following equation or tool life is given in turning $VT^{0.13} f^{0.77} d^{0.37} = c$.

A 60 minute tool life was obtained while cutting at v = 30 m/min, f = 0.3 mm/rev and d = 2.5 mm. Determine the change in tool life if the cutting speed, feed and depth of cut are increased by 20% individually and also taken together. [10]

(*b*) Sketch and explain the Merchant's circle of cutting forces. [6]

3. (*a*) Explain various types of broaching machine. [6]

(*b*) Explain thread rolling process with neat sketch. [5]

(*c*) What is gear hobbing ? Explain gear hobbing principle. [5]

Or

4. (*a*) Draw the neat sketch of broach geometry detail. [6]

(*b*) Explain the concept of gear shaping process with neat sketch. [5]

(*c*) What is a thread chaser ? Briefly describe it. [5]

5. (*a*) Explain the classification of NC system according to motion control system. [6]

(*b*) Differentiate between Open Loop and Closed Loop CNC System. [6]

(*c*) Write short notes on (any *two*) : [6]

(*i*) Machine center

(*ii*) FMS

(*iii*) DNC.

Or

6. (*a*) Draw a block diagram of CNC system and explain the function of it. State advantages and limitations of it. [6]

(*b*) Explain the classification of NC system according to tool positioning with suitable example. [6]

(*c*) Write the function of the following codes : [6]

G71, G90, G33, M02, M04, M08.

SECTION II

7. (*a*) Explain various methods of reducing shear forces. [6]

(*b*) For the work piece made up of copper plate of thickness 2 mm. Design : [8]

(*i*) blanking die

(*ii*) blanking punch

(*iii*) press tonnage

(*iv*) strip layout for single die. Shear strength for copper is 280 N/mm^2.

Assume clearance is 5% of thickness.

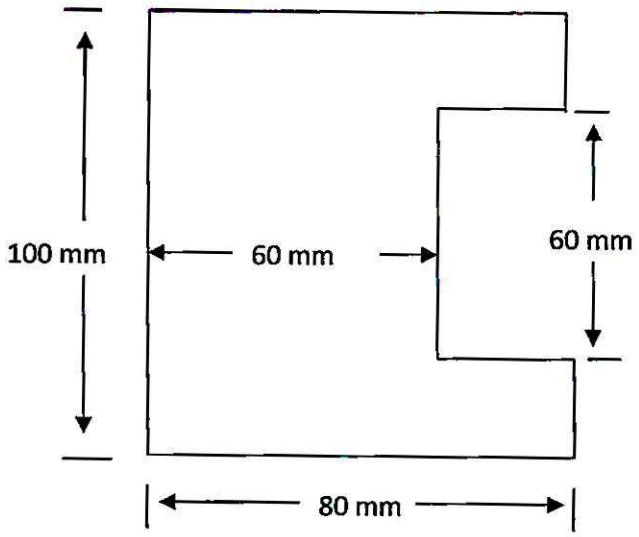


Fig. 1

(*c*) Differentiate between bending and drawing. [4]

Or

8. (*a*) Determine center of pressure for the same component shown in figure 1. [6]

(*b*) Explain function of each element of simple die with neat sketch. [8]

(*c*) Define (any *two*) : [4]

(*i*) Pilot

(*ii*) Shut height

(*iii*) Shear.

9. (*a*) Draw self explanatory diagram of AJM. [4]

(*b*) Explain why EBM process is carried out in vacuum. [4]

(*c*) What are the requirements of tool material for EDM. Name common tool materials. [4]

(*d*) What is difference between USM and conventional grinding ? [4]

Or

10. (*a*) Enlist applications of IBM and PAM. [6]

(*b*) Explain working of Laser beam machining with neat sketch. [6]

(*c*) Enlist advantages and limitations of ECM. [4]

11. (*a*) What are the general guiding principals of fixture design ? [6]

(*b*) Describe quick acting clamping device with neat sketch. [6]

(*c*) Explain working of channel type jig with neat sketch. [4]

Or

12. (*a*) Write a short note on bushes used in jigs. [6]

(*b*) Explain principal of redundant location and principal of fool proofing with neat sketch. [6]

(*c*) Design and sketch drill jig for drilling two holes of ϕ 8 mm in the part as shown in figure 2. [4]

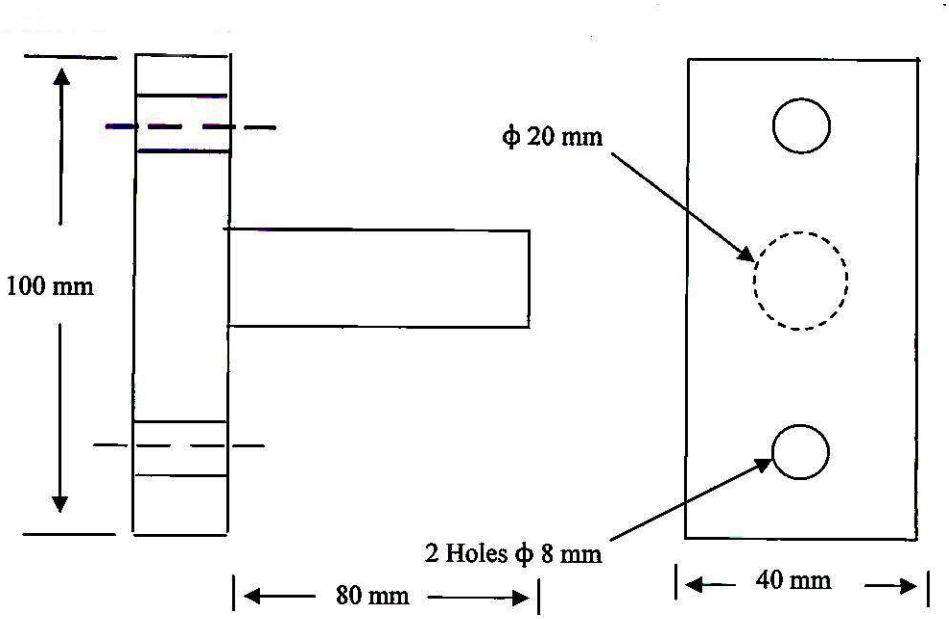


Fig. 2

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-122

S.E. (Mechanical S/W) (Second Semester) EXAMINATION, 2015

COMPUTER APPLICATIONS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right side indicate full marks.

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data, if necessary.

Section I

1. (*a*) Find the real root of the equation $x^3 - 2x - 5 = 0$ using Newton-Raphson Method to 3 decimal places, tale initial value of x as 3. [8]

(*b*) Draw flow chart for Simpson's 3/8 rule. [8]

Or

2. (*a*) Draw flow chart for successive approximation method. [8]

P.T.O.

(*b*) Evaluate :

$$I = \int_0^1 \left(\frac{1}{1 + x} \right) dx$$

using Simpson's 1/3 rule. Take $h = 0.25$. [8]

3. (*a*) Using Newton's Backward Difference Interpolation find $f(0.26)$ [8]

x	**F(*x*)**
0.1	0.1003
0.15	0.1511
0.2	0.2027
0.25	0.2553
0.3	0.3093

(*b*) Draw flow chart for Lagrange's Interpolation. [8]

Or

4. (*a*) Draw flow chart for Newton's Foward Difference Interpolation. [8]

(*b*) Find

$\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for $x = 1.2$ using the following table : [8]

x	y
1.2	3.3201
1.4	4.0552
1.6	4.9530
1.8	6.0496
2.0	7.3891
2.2	9.0250

5. (*a*) What is Partial Pivoting ? Explain with example. [8]

(*b*) Solve the following set of simultaneous equations using Gauss Elimination Method : [10]

$$3x + y + 2z = 3$$

$$2x - 3y - z = -3$$

$$x + 2y + z = 4$$

Or

6. (*a*) Explain the procedure for solution of simultaneous equations using Cholesky method. [8]

(*b*) Solve the following set of simultaneous equations using LU Decomposition method : [10]

$$2x + 3y + z = 9$$

$$x + 2y + 3z = 6$$

$$3x + y + 2z = 8$$

Section II

7. (*a*) Explain : [8]

(*i*) Round off error

(*ii*) Truncation error

(*iii*) Error propagation

(*b*) Using least square technique fit the curve $y = a\ x^b$ for a set of the following data : [8]

x	***y***
0.5	0.742
1.5	3.857
2.0	5.939
2.5	8.301
3.0	10.912

Or

8. (*a*) Draw the flowchart to fit quadratic curve to the given set of data (x, y). [8]

(*b*) Fit the following data to the straight line $y = a + bx$ using least square technique : [8]

x	***y***
10	14.357
20	16.651
30	16.735
40	17.676
50	18.512
60	24.8

9. (*a*) Solve the ODE using modified Euler's method : [8]

$$\frac{dy}{dx} = \frac{-y}{2y + 1}; \; y(0) = 1$$

find y for $x = 1$ with $h = 0.5$

(*b*) Draw the flowchart for solving ODE using Predictor-Corrector method. [8]

Or

10. (*a*) Solve ODE using Runge-Kutta fourth order method : [8]

$$\frac{dy}{dx} = y(x^2 - 1);\ y(0) = 1$$

Find y when $x = 1$ with $h = 0.5$

(*b*) Solve using Euler's method : [8]

$\frac{dy}{dx} = \frac{x^2 + y^2}{2}$, for $y(1.6)$ with $y(0) = 2$ using $h = 0.4$

11. (*a*) Solve $u_t = u_{xx}$ for the following conditions using Schmidt method : [8]

At $x = 0$ and $x = 3$, $u = 0$ for all t's.

At $t = 0$, $u = x^2$ for $0 < x < 3$.

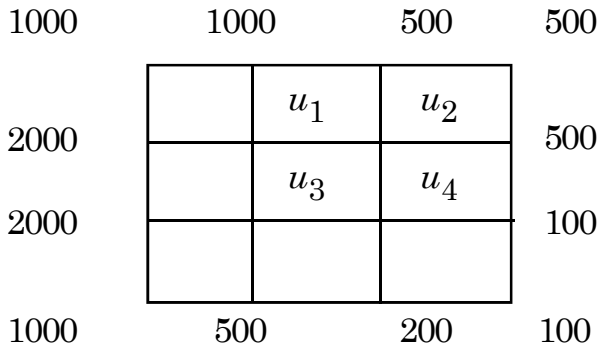
Assume $h = 1$, $k = 0.1$, find u at $t = 0.3$

(*b*) Draw the flowchart for solving Laplace equation. [10]

Or

12. (*a*) Draw the flowchart for solving heat conduction equation. [8]

(*b*) Solve the Laplace equation, $u_{xx} + u_{yy} = 0$ for the following square mesh : [10]



Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-126

S.E. (Mech./SW) (Second Sem.) EXAMINATION, 2015

THERMAL ENGINEERING–II

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

UNIT I

1. (*a*) Draw p-V diagram and T-s diagram for a reversed Carnot cycle. [6]

P.T.O.

(*b*) A refrigerating system operates on the reversed Carnot cycle. The higher temperature of the refrigerant in the system is 35°C and the lower temperature is –15°C. The capacity is to be 12 tones. Neglect all losses. Determine : [10]

(*i*) Coefficient of performance.

(*ii*) Heat rejected from the system per hour.

(*iii*) Power required.

Or

2. (*a*) Write in brief elements of Refrigeration Systems. [6]

(*b*) Ice is formed at 0°C from water at 20°C. The temperature of the brine is –8°C. Find out the kg of ice formed per kWh. Assume that the refrigeration cycle used is perfect reversed Carnot cycle. Take latent heat of ice as 335 kJ/kg. [10]

UNIT II

3. (*a*) Define the following terms : [8]

(*i*) Wet bulb temperature

(*ii*) Relative humidity

(*iii*) Dry bulb temperature

(*iv*) Dew point temperature.

(*b*) The atmospheric conditions are 20°C and specific humidity of 0.0095 kg/kg of dry air. Calculate the following : [8]

(*i*) Partial pressure of vapour

(*ii*) Relative humidity.

Or

4. (*a*) Explain heating and humidification on psychrometric chart. [8]

(*b*) 0.004 kg of water vapour per kg of atmospheric air is removed and temperature of air after removing the water becomes 20°C. Determine : [8]

(*i*) Relative humidity

(*ii*) Dew point temperature.

Assume that the condition of atmospheric air is 30°C and 55% R.H. and pressure is 1.0132 bar.

UNIT III

5. (*a*) Explain any *one* expansion devices used in refrigeration and air-conditioning system with neat sketch. [6]

(*b*) Explain the common refrigeration controls. [6]

(*c*) Write a short note on losses in duct. [6]

Or

6. (*a*) Explain the methods for determination of duct size. [6]

(*b*) Describe any *two* types of condensing devices used in refrigeration system. [6]

(*c*) Write in brief about installation and charging a new of refrigeration system. [6]

SECTION II

UNIT IV

7. (*a*) Explain with neat sketch Valve timing diagram. [8]

(*b*) A diesel engine consumes fuel at the rate of 5.5 gm/sec. and develops a power of 75 kW. If the mechanical efficiency is 85%, calculate bsfc and isfc. The lower heating value of the fuel is 44 MJ/kg. [8]

Or

8. (*a*) Discuss any *one* method to find indicated power. [8]

(*b*) A six-cylinder, four-stroke engine gasoline engine having a bore of 90 mm and stroke of 100 mm has a compression ratio 8. The relative efficiency is 60%. When the indicated specific fuel

consumption is 3009 g/kWh. estimate : [8]

(*i*) The calorific value of the fuel and

(*ii*) Corresponding fuel consumption given that imep is 8.5 bar and speed is 2500 rpm.

UNIT V

9. (*a*) Explain stages of combustion in C.I. engine. [8]

(*b*) Write a short note on types of combustion chambers in S.I. engines. [8]

Or

10. (*a*) Explain the phenomenon of detonation. What are the effects of detonation on performance of the engine ? [8]

(*b*) What is the difference in diesel knock and detonation. [8]

UNIT VI

11. (*a*) Write a note on engine emissions and their harmful effects. [6]

(*b*) Explain with neat sketch catalytic converter. [6]

(*c*) How are SI engine emissions different from CI engine emissions ? [6]

Or

12. (*a*) What is turbocharging ? How is it achieved ? What are its advantages ? [6]

(*b*) What are the latest emission norms ? [6]

(*c*) What are the sources of emission from SI engine ? [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-127

S.E. (Mech. S/W) (Second Semester) EXAMINATION, 2015

MANUFACTURING ENGINEERING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right side indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data if necessary.

SECTION I

1. (*a*) Explain investment casting process. [6]

(*b*) Explain continuous casting process. [6]

(*c*) Explain Roll forming process. [6]

Or

2. (*a*) Explain indirect extrusion process. [6]

(*b*) Write short notes on tube drawing process. [6]

(*c*) Explain various types of cores in casting. [6]

P.T.O.

3. (*a*) Explain submerged arc welding process with its advantages limitations and applications. [8]

(*b*) Explain spot, seam and projection welding process. [8]

Or

4. (*a*) Explain oxyacetylene gas welding process. Write one application of varies flames obtained in oxyacetylene process. [7]

(*b*) What are the various joints for welding process ? [5]

(*c*) Explain braze welding. [4]

5. (*a*) State various taper turning method. Explain any *one* in detail. [8]

(*b*) Explain the working of universal dividing head with neat sketch in milling machine. [8]

Or

6. (*a*) State various drilling operations with sketch. [8]

(*b*) Explain up milling and down milling operations. [8]

SECTION II

7. (*a*) The following data was collected from an orthogonal machine test on steel : [12]

Chip thickness ratio = 0.383 mm

Uncut chip thickness = 0.5 mm

Rake angle = 15°

Width of cut = 3 mm

Yield stress of material in shear 280 N/mm^2

Coefficient of friction on tool face = 0.7

Determine normal and tangential forces on tool face.

(*b*) Explain gear shaping and gear hobbing process. [6]

Or

8. (*a*) A carbide tool with mild steel workpiece was found to give tool life of 2 hours while machining with 50 mpm. Compute the tool life if same tool is used at 25% higher speed than previous one. Also value of the cutting speed if tool has to give a tool life of 3 hours. Assume Taylor's exponent "*n*" = 0.27. [8]

(*b*) Explain the Pull and Push type broaching machines. [6]

(*c*) Explain thread milling process. [4]

9. (*a*) Compare NC, CNC and machining center. [8]

(*b*) Explain the LBM process with neat sketch. [8]

Or

10. (*a*) Explain machining center with ATC. [8]

(*b*) Compare Non-conventional machining process on the basis of power source, type of material to be machined, shape and accuracy etc. [8]

11. (*a*) Explain compound and combination die. [8]

(*b*) Redundancy in locator. [4]

(*c*) State various types of locators with their typical advantages. [4]

Or

12. (*a*) Explain the concept of shear and clearance in blanking operation. What is effect of above factor on cutting force ? [8]

(*b*) Compare Jig and fixtures. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4757]-129

S.E. (Mech. Sand.) (Second Semester) EXAMINATION, 2015

THEORY OF MACHINES AND MACHINE DESIGN—I

(2008 PATTERN)

Time : Four Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

UNIT I

1. (*a*) Explain with neat sketches 'Pantograph'. [6]

(*b*) What is the condition for correct steering ? Explain with neat sketch Ackermann steering gear mechanism. [6]

(*c*) Explain Kutzbach's criterion for degree of freedom of planer mechanism. [4]

P.T.O.

Or

2. (*a*) With the help of neat sketch, prove that in first inversion of double slider crank chain, any point on the coupler link traces ellipse. Also prove that the midpoint of the coupler traces circle. [6]

(*b*) Write a short note on Whitworth quick return mechanism. [6]

(*c*) Write a note on Hooke's joint and its applications. [4]

UNIT II

3. (*a*) The mechanism of a wrapping machine as shown in Fig. 1 has the following dimensions; O_1A = 100 mm, AC = 700 mm, BC = 200 mm, O_3C = 200 mm, O_2E = 400 mm, O_2D = 200 mm and BD = 150 mm. The crank O_1A rotates at a uniform speed of 100 rad/s. Find the velocity of point E of the bell crank lever by instantaneous center method. [12]

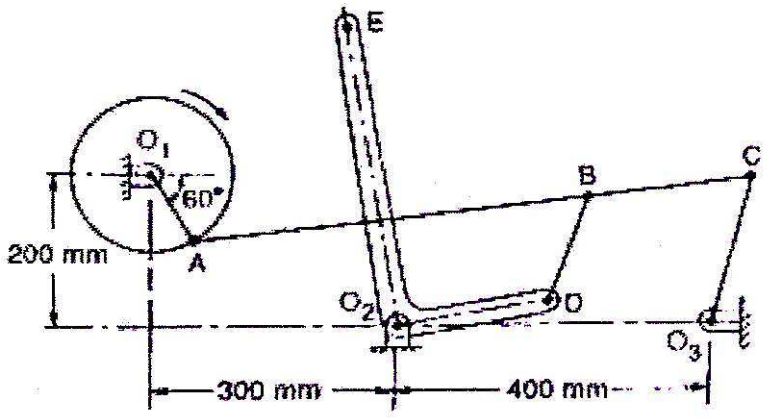


Fig. 1

(*b*) The four bar mechanism as shown in Fig. 2, which is driven by link 2 at 45 rad/sec, counterclockwise. Find the angular velocity of link 3 and 4 using complex number method. [6]

AB = 100 mm

CD = 300 mm

AD = 250 mm.

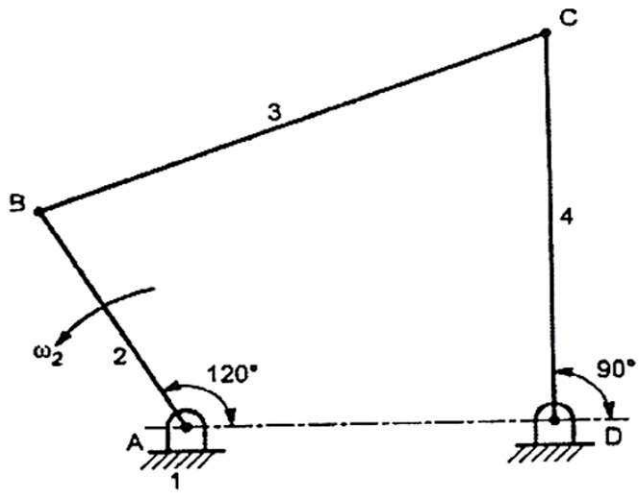


Fig. 2

Or

4. In the mechanism as shown in Fig. 3, the crank OA is 80 mm long and it rotates clockwise about O at 150 rpm. The connecting rod is 320 mm long. At a point C on AB 120 mm from A, the rod CE of 350 mm length is attached. The rod CE slides in a slot in a trunnion at D. The link EF is 260 mm long with horizontal

movement of slider. For the shown position of mechanism, find the velocity and acceleration of slider F. [18]

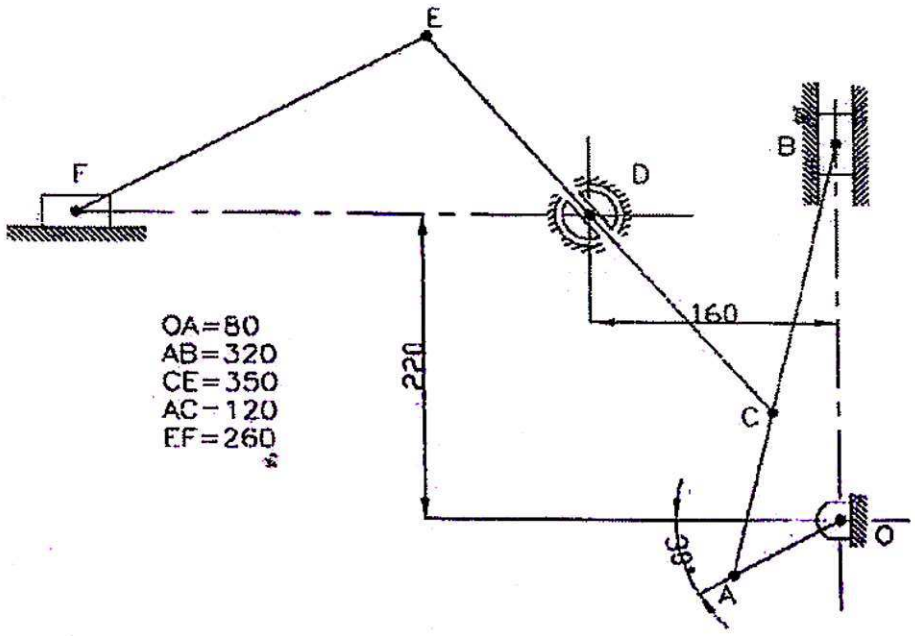


Fig. 3

UNIT III

5. (*a*) In an I.C. engine mechanism, the stroke of the slider is 180 mm and the obliquity ratio is 4.25. The crank rotates uniformly at 500 rpm clockwise. Find analytically :

(*i*) Velocity and acceleration of piston and

(*ii*) Angular velocity and angular acceleration of connecting rod, when the slider has moved through 350 mm from top dead centre position. [8]

(*b*) A connecting rod of a petrol engine has a mass of 2 kg and the distance between the centre of gudgeon pin and centre of crank pin is 250 mm. The C.G. falls at a point 100 from the crank pin along the centre line joining the centre of crank pin and the gudgeon pin. The radius of gyration about an axis through C.G. perpendicular to the plane of rotation is 115 mm. Find the equivalent kinetically system if only one the mass is located at the gudgeon pin. If the connecting rod is replaced by the two masses, one at the gudgeon pin centre and the other at the crank pin centre, and the angular acceleration of the rod is 22500 rad/sec^2 clockwise, determine the correction couple applied to this system to reduce it to a kinetically equivalent system. [8]

Or

6. (*a*) The marine engine has a stroke of 200 mm and connecting rod length 400 mm its C.G. being 175 mm from the crank pin centre and radius of gyration about C.G. being 125 mm. The connecting rod has a mass of 120 kg and the reciprocating mass is 90 kg. The crank rotates at 240 rpm. Determine; the crankshaft torque due to inertia of the reciprocating parts, the kinetic energy of the connecting rod for a crank angle of 45°. [8]

(*b*) Derive the frequency equation for Tri-filar suspension. [8]

SECTION II

UNIT IV

7. (*a*) A belt pulley is keyed to the shaft midway between the supporting bearings kept at 1000 mm apart. The shaft transmits 20 kW power at 400 rpm. The pulley has 400 mm diameter. The angle of warp of belt on pulley is 180° and the belt tension acts vartically downwards. The ratio of belt tensions is 2.5. The shaft is made of steel having an ultimate tensile strength of 400 N/mm^2 and 240 N/mm^2 respectively.

The combined shock and fatigue factor is bending and torsion are 1.5 and 1.25 respectively. Design the shaft. [10]

(*b*) Explain the Design procedure for splines. [6]

Or

8. (*a*) A welded joint as shown in Fig. 4, is subjected to an eccentric load of 2 kN. Find the size of weld, if the maximum shear stress in the weld is 25 MPa. [8]

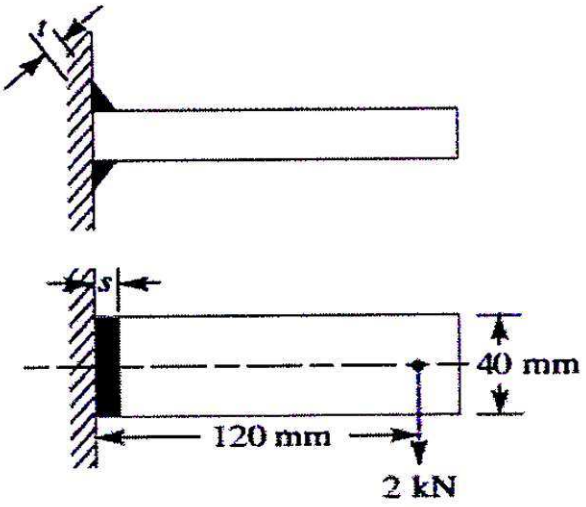


Fig. 4

(*b*) Discuss design procedure for flexible flanged coupling along with relevant equation and necessary sketches. [8]

UNIT V

9. (*a*) The cutter of a broaching machine is pulled by square threaded screw of 55 mm external diameter and 10 mm pitch. The operating nut takes the axial load of 400 N on a flat surface of 60 mm and 90 mm internal and external diameters respectively. If the coefficient of friction is 0.15 for all contact surfaces on the nut, determine the power required to rotate the operating nut when the cutting speed is 6 m/min. Also find the efficiency of the screw. Assume uniform wear conditions to account for collar friction. [10]

(*b*) Explain the construction of multileaf spring with sketch. [6]

Or

10. (*a*) Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity, G = 84 kN/mm^2.

Neglect the effect of stress concentration. [10]

(*b*) Explain with neat sketch 'Recirculating Ball Screw'. [6]

UNIT VI

11. (*a*) A single cylinder double acting steam engine develops 100 kW at a mean speed of 80 rpm. The coefficient of fluctuation of energy is 0.1 and the fluctuation of speed is ± 2% of mean speed. If the mean diameter of the flywheel rim is 2 metres and the hub and spokes provide 5 percent of the rotational inertia of the wheel, find the mass of the flywheel and cross-sectional area of the rim. Assume the density of the flywheel material (which is cast iron) as 7200 kg/m^3. [10]

(*b*) Write notes on : [8]

(*i*) Slip and Creep of belt

(*ii*) Maximum power trnasmitted by belt.

Or

12. (*a*) Design a rubber belt to drive a dynamo generating 20 kW at 2250 rpm and fitted with a pulley 200 mm diameter. Assume dynamo efficiency to be 100%.

Allowable stress for belt = 2.1 MPa

Density of rubber = 1000 kg/m^3

Angle of contact for dynamo pulley = 165°

Coefficient of friction between belt and pulley = 0.3. [10]

(*b*) Write notes on : [8]

(*i*) Turning moment diagram for 4S internal combustion engine

(*ii*) Design of solid rimmed flywheel.

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4757]-130

S.E. (Mechanical Sandwich) (First Semester)

EXAMINATION, 2015

THERMAL ENGINEERING-I

(2008 Pattern)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define flow process. Write down the steady flow energy equation for the following engineering system : [6]

(*i*) Boiler

(*ii*) Evaporator

(*iii*) Turbine.

P.T.O.

(*b*) 0.2 kg of air with P_1 = 1.5 bar and T_1 = 300 K is compressed to a pressure of 15 bar according to the law $PV^{1.25}$ = constant.

Determine : [10]

(*i*) Initial and final parameter of the air

(*ii*) Work done on *or* by the air

(*iii*) Heat flow to *or* from the air

(*iv*) Change of entropy stating whether it is an increase *or* decrease.

Or

2. (*a*) Discuss available and unavailable heat energy. [6]

(*b*) Obtain an expression for work done, heat transfer and change of enthalpy during Isothermal process with P-V and T-S diagram. [10]

3. (*a*) Explain the construction and working of Cochran Boiler with neat sketch. [6]

(*b*) A coal fined boiler plant consumes 400 kg of coal per hour. The boiler evaporator 3200 kg of water at 44.5°C into superheated steam at a pressure of 12 bar and 274.5°C. If the calorific value of the fuel is 32760 kJ/kg of coal, determine :

(*i*) Equivalent evaporation from and at 100°C

(*ii*) Thermal efficiency of the boiler

Assume specific heat of superheated steam as 2.1 kJ/kg-K. [10]

Or

4. (*a*) Define and explain the importance of Boiler accessories. Explain with neat sketch any *two* Boiler accessories. [6]

(*b*) In a boiler, the following observations were made pressure of the steam = 10 bar [10]

Steam condensed = 540 kg/hr

Fuel used = 65 kg/hr,

Moisture in fuel = 2% by mass

Mass of dry flue gases = 9 kg/kg of fuel

Lower calorific value of fuel = 32000 kJ/kg

Temperature of flue gases = 325°C

Temperature of boiler house = 28°C

Feed water temperature = 50°C

Mean specific heat of flue gases = 1 kJ/kg-K

Dryness fraction of steam = 0.95

Draw up a heat balance sheet for the boiler.

5. (*a*) Define and explain the significance polytropic process. Obtain an expression for work done, change in internal energy of steam and heat absorbed by steam. [8]

(*b*) One kg of steam at pressure of 17.5 bar and dryness 0.95 is heated a constant pressure, until it is completely dry. Determine : [10]

(*i*) The increase in volume

(*ii*) The quantity of heat supplied

(*iii*) The change in entropy.

Or

6. (*a*) Explain Carnot cycle with steam as a working substance using P-V and T-S diagram. [8]

(*b*) One kg of steam at a pressure of 1 bar and 0.8 dry is compressed in a cylinder to a pressure of 2 bar. The law of compression is $PV^{1.2}$ = Constant. [10]

Find :

(*i*) The final condition of the steam

(*ii*) Change in internal energy

(*iii*) The heat passes through the cylinder walls.

SECTION II

7. (*a*) Explain experimental determination of higher calorific value of Bomb Calorimeter. [6]

(*b*) During a boiler trial, the dry flue gas analysis by vol. was reported as :

CO_2 = 13%, CO = 0.3%, O_2 = 6%, N_2 = 80.7%.

The coal analysis by mass : C = 62.4%, H_2 = 4.2%, O_2 = 4.5%, Moisture = 15%. Calculate : [10]

(*i*) Minimum air required to burn 1 kg of coal

(*ii*) Mass of air actually supplied per kg of coal

(*iii*) The amount of excess air supplied per kg of coal burnt.

Or

8. (*a*) Explain flue gas analysis using Orsat apparatus. [6]

(*b*) The following data refers to Calorific Value test of a fuel by means of a gas calorimeter :

Volume of a gas used = 0.7 m^3, mass of water heated = 25 kg. rise in temperature of water at inlet & outlet = 14°C. Mass of steam condensed = 0.028 kg.

Find the higher and lower Calorific Values per m^3 at S.T.P. Take the heat liberated in condensing water vapour and cooling the condensable 2475 kJ/kg. [10]

9. (*a*) Explain Diesel cycle with P.V and T-S diagram. [6]

(*b*) In a compression ignition engine, working on dual combustion cycle. Pressure and temperature at the start of compression are 1 bar and 300 K respectively. At the end of compression, pressure reaches a value of 25 bar 420 kJ of heat is supplied per kg of air during constant volume heating and pressure becomes 2.8 bar at the end of isentropic expansion. Estimate the ideal thermal efficiency.

Take C_p = 1.005 kJ/kg-K and C_v = 0.712 kJ/kg-K [10]

Or

10. (*a*) Explain Otto cycle with P-V and T-S diagram. [6]

(*b*) An oil engine, working on dual combustion cycle has a compression ratio 10 and cut-off takes place at 1/10th of stroke. If the pressure at the beginnings of compression is 1 bar and maximum pressure 40 bar. Determine the air-standard efficiency of cycle. Take $\gamma = 1.4$. [10]

11. (*a*) Explain work done by reciprocating air compressor without and with clearance volume. [8]

(*b*) A two-stage compressor takes in 2.82 m^3 of air per minute at a pressure of 1.05 bar and temperature of 22°C. It delivers the air at 8.44 bar. The compression is carried out in each cylinder according to the law $PV^{1.2}$ = constant. The air is cooled to its initial temperature in intercooler. Neglecting clearance, find the maximum power required to drive the compressor. [10]

Or

12. (*a*) Obtain the expression for minimum work required for a two-stage reciprocating compressor. [8]

(*b*) A three-stage compressor compress air from 1 bar to 35 bar and delivers it at the higher pressure to receiver. The initial temperature is 17°C. The law of compression is $PV^{1.2}$ = constant and is the same for each stage.

Assuming conditions of minimum work, perfect inter cooling and the effect of cylinder clearance and valve resistance etc. may be neglected. Find the power required to deliver 14 m^3/min, measured at the suction conditions. Find also the intermediate pressures. [10]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

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S.E. (Electrical/Inst./Comp./I.T.) (First Semester)

EXAMINATION, 2015

ENGINEERING MATHEMATICS–III

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q. No. **5** or Q. No. **6** from Section I and Q. No. **7** or Q. No. **8**, Q. No. **9** or Q. No. **10**, Q. No. **11** or Q. No. **12** from Section II.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, electronic pocket calculator is allowed.

(*v*) Neat diagrams must be drawn wherever necessary.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (A) Solve the following (any *three*) : [12]

(*i*) $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^{e^x}$

P.T.O.

(*ii*) $(D^2 - 4)y = e^{3x} x^2$

(*iii*) $\frac{d^2y}{dx^2} + y = \text{cosec } x$ (by method of variation of parameters).

(*iv*) $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 5y = x^2 \sin (\log x)$.

(B) An uncharged condensor of capacity C charged by applying an e.m.f. of value $E \sin \frac{t}{\sqrt{LC}}$ through the leads of inductance L and of negligible resistance. The charge Q on the plate of condenser satisfies the differential equation :

$$\frac{d^2Q}{dt^2} + \frac{Q}{LC} = \frac{E}{L} \sin \frac{t}{\sqrt{LC}}.$$

Find charge Q at any time *t*. [5]

Or

2. (A) Solve the following (any *three*) : [12]

(*i*) $(D^2 - 4D + 4)y = x e^{2x} \sin 2x$

(*ii*) $(D^3 + D)y = \cos x$

(*iii*) $\frac{dx}{y} = \frac{dy}{-x} = \frac{dz}{xe^{x^2+y^2}}$

(*iv*) $\frac{d^2y}{dx^2} + 2 \frac{dy}{dx} + y = 5^x + 2 + e^x$.

(B) Solve the system of equations : [5]

$$\frac{dx}{dt} + y = e^{t}; \quad \frac{dy}{dt} + x = e^{-t}.$$

3. (A) Find the analytic function $f(z)$ whose imaginary part is : [6]

$$V = \cos x \cosh y.$$

(B) Evaluate :

$$\oint_{C} \frac{\sin^2 z}{(z - \frac{\pi}{6})^3} dz$$

where C is the circle $|z| = 1$. [5]

(C) Find the map of straight line $y = x$ under the transformation

$$w = \frac{z-1}{z+1}.$$ [5]

Or

4. (A) If $f(z)$ is analytic, show that : [5]

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |f(z)|^2 = 4 |f'(z)|^2.$$

(B) By using Cauchy's residue theorem, evaluate : [6]

$$\oint_{C} \frac{z+2}{z^2+1} dz$$

where $C : |z - i| = \frac{1}{2}$.

(C) Find the bilinear transformation which maps the points $-i$, 0, $2 + i$ of z-plane to the points 0, $-2i$, 4. [5]

5. (A) Using Fourier integral representation, prove that : [6]

$$\int_0^{\infty} \frac{1-\cos \lambda\pi}{\lambda} \sin \lambda x \; d\lambda = \begin{cases} \frac{\pi}{2} & , \quad 0 < x < \pi \\ 0 & , \quad x > \pi \end{cases} .$$

(B) Find Fourier cosine integral representation of : [5]

$$f(x) = 2e^{-5x} + 5e^{-2x} .$$

(C) Find z-transform of the following (any *two*) : [6]

(*i*) $f(k) = k\, 2^k, \quad k \geq 0$

(*ii*) $f(k) = \sin(2k + 5), \quad k \geq 0$

(*iii*) $f(k) = \frac{3^k}{k}, \quad k \geq 1 .$

Or

6. (A) Find inverse z-transform of the following (any *two*) : [6]

(*i*) $F(z) = \frac{1}{(z-3)(z-2)}, \quad |z| < 2$

(*ii*) $F(z) = \frac{z^2}{(z-\frac{1}{4})(z-\frac{1}{5})}, \quad |z| > \frac{1}{5}$

(*iii*) $F(z) = \frac{10z}{(z-1)(z-2)}$ (by inversion integral method).

(B) Solve the difference equation : [5]

$$f(k+1) - 2f(k) = 2^k, \; f(0) = 1, \; k \geq 0 .$$

(C) Using inverse sine transform, find $f(x)$ if : [6]

$$F_s(\lambda) = \frac{1}{\lambda} e^{-a\lambda} .$$

SECTION II

7. (A) The first four moments of a distribution about the value 4 of the variable are –1.5, 17, –30 and 108. Find the moments about mean, coefficient of skewness and kurtosis. [7]

(B) Find the correlation coefficient and regression lines for the data : [9]

x	y
1	2
2	5
3	3
4	8
5	7

Or

8. (A) In sampling a large number of parts manufactured by a machine, the mean number of defectives in a sample of 20 is 2. Out of 1000 such samples, how many would be expected to contain at least 3 defective parts. [6]

(B) In a test on 2000 electric bulbs, it was found that the life of a particular make, was normally distributed with an average life of 2040 hours and standard deviation of 60 hours. Estimate the number of bulbs likely to burn for more than 1920 hours and less than 2160 hours.

(Area corresponding to $z = 2$ is 0.4772). [6]

(C) In a Poisson distribution, if :

$$p(r = 1) = 4\, p(r = 2),$$

find $p\,(r = 3)$. [4]

9. (A) Find the angle between the surfaces :

$$x^2 + y^2 + z^2 = 9 \quad \text{and} \quad z = x^2 + y^2 - 3$$

at the point (2, –1, 2). [4]

(B) Find the directional derivative of $\phi = 5x^2y - 5y^2z + z^2x$ at the point (1, 1, 1) in the direction of the line : [5]

$$\frac{x-1}{2} = \frac{y-3}{-2} = z\,.$$

(C) Prove that (any *two*) : [8]

(*i*) $\nabla\left(\dfrac{\bar{a}\,.\,\bar{r}}{r^5}\right) = \dfrac{\bar{a}}{r^5} - \dfrac{5\,(\bar{a}\,.\,\bar{r})}{r^7}\,\bar{r}$

(*ii*) $\nabla^2\left[\nabla\,.\left(\dfrac{\bar{a}}{r^2}\right)\right] = \dfrac{2}{r^4}$

(*iii*) $\nabla^4\,(r^2 \log\, r) = \dfrac{6}{r^2}\,.$

Or

10. (A) If a vector field is given by : [6]

$$\bar{F} = (x^2 - y^2 + x)\,\bar{i} - (2xy + y)\,\bar{j}\,,$$

is this field irrotational ? If so find its scalar potential.

(B) Find the values of a and b such that the surfaces : [6]

$$ax^2 - byz = (a+2)x \quad \text{and} \quad 4x^2y + z^3 = 4,$$

cut orthogonally at (1, –1, 2).

(C) Show that :

$$\bar{F} = f(r)\,\bar{r},$$

is always irrotational and find $f(r)$ such that $\bar{F}$ is solenoidal. [5]

11. (A) Evaluate :

$$\int_C \bar{F} \cdot d\bar{r}$$

along the path C is $x = 2t$, $y = t$, $z = t^3$ from $t = 0$ to $t = 1$.

Where $\bar{F} = (2y + 3)\bar{i} + xz\,\bar{j} + (yz - x)\bar{k}$. [5]

(B) Evaluate using Stokes theorem : [6]

$$\int_C (2x - y)\,dx - yz^2 dy - y^2 z dz,$$

where C is the circle $x^2 + y^2 = 1$, $z = 0$.

(C) Evaluate :

$$\iint_S \bar{F} \cdot \hat{n}\, dS, \quad \text{where} \quad \bar{F} = 4xz\,\bar{i} - y^2\,\bar{j} + yz\,\bar{k}$$

and S is the surface of the cube bounded by :

$x = 0$, $x = 1$, $y = 0$, $y = 1$, $z = 0$, $z = 1$. [6]

Or

12. (A) Apply Green's theorem to evaluate :

$$\int_C (2x^2 - y)\, dx + (x + y^2)\, dy$$

where C is the boundary of the region defined by :

$$y = \sqrt{x} \quad \text{and} \quad y = x^2 . \qquad [5]$$

(B) Evaluate :

$$\iint_S \nabla \times \bar{F} \cdot d\bar{S}$$

for $\bar{F} = y\,\bar{i} + z\,\bar{j} + 2x^2\,\bar{k}$,

where S is the surface of the paraboloid $z = 16 - x^2 - y^2,\ z \geq 0$. [6]

(C) Evaluate :

$$\iint_S 2(x^3\,\bar{i} + y^3\,\bar{j} + z^3\,\bar{k}) \cdot d\bar{S},$$

where S is the surface of the sphere $x^2 + y^2 + z^2 = 1$. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

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S.E. (Electrical) (First Semester) EXAMINATION, 2015

POWER PLANT ENGINEERING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two sections should be written in separate answer books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

Section I

1. (*a*) Show Carnot cycle on T-S diagram for : [10]

(*i*) Wet steam

(*ii*) Saturated steam and

(*iii*) Superheated steam.

Derive an expression for its thermal efficiency.

P.T.O.

(*b*) With the help of a neat sketch, explain how Bomb calorimeter is used to determine the calorific value of a fuel. [8]

Or

2. (*a*) Explain how Orsat apparatus is used for flue gas analysis. [10]

(*b*) What is pulverisation of coal ? Explain any *one* pulverizing mill. [8]

3. (*a*) What are the various types of steam turbines ? Explain with neat sketch the construction and working of an Impulse steam turbine. [8]

(*b*) Draw a neat sketch of layout of thermal power plant and explain the functions of main components in it. [8]

Or

4. (*a*) Write a short note on electrostatic precipitator. [6]

(*b*) Explain any *two* types of coal conveyors used in steam power plants. [10]

5. (*a*) Explain with neat sketch the construction and working of a Pelton wheel. [8]

(*b*) What is draft tube ? What is its function ? Explain various types of draft tubes in brief. [8]

Or

6. (*a*) Explain the factors to be considered for selection turbines in hydroelectric power plants. [6]

(*b*) Explain various types of Dams in brief. [10]

Section II

7. (*a*) Discuss the applications, advantages and disadvantages of Diesel Power Plants. [6]

(*b*) Explain the following parts of nuclear reactor with their functions : [12]

(*i*) Moderator

(*ii*) Control rods and

(*iii*) Shielding

Or

8. (*a*) Explain the various factors to be considered for selection of site for diesel power plant and explain the function of various components in it. [12]

(*b*) Explain the fast breeder reactor with neat sketch. [6]

9. (*a*) Explain closed loop and open loop gas turbine power plants. [8]

(*b*) Write a note on perspects and development of non-conventional power plants in India. [8]

Or

10. (*a*) Explain how efficiency of simple gas turbine cycle can be increased by : [8]

(*i*) Reheating and

(*ii*) Regeneration.

(*b*) Explain how energy is harnessed from geothermal power plant. [8]

11. (*a*) Explain the various factors affecting the cost of generation. [8]

(*b*) Write short notes on the following : [8]

(*i*) Incremental fuel cost curve

(*ii*) Incremental fuel rate curve.

Or

12. (*a*) Define : [8]

(*i*) Load factor

(*ii*) Diversity factor

(*iii*) Utilization factor

(*iv*) Plant capacity factor.

(*b*) Explain various methods of calculating tariffs. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

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S.E. (Electrical) (First Sem.) EXAMINATION, 2015

MATERIAL SCIENCE

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

Physical Constants :

(1) Angstrom Unit(AU) = 1×10^{-10} metres

(2) Boltzmann's Constant (k) = 1.380×10^{-23} joule-degree^{-1}

(3) Charge on Electron (e) = 1.601×10^{-19} coulomb

(4) Mass of Electron (m) = 9.107×10^{-31} kg

(5) Electron volt (eV) = 1.602×10^{-19} joules

(6) Mass of Proton (m_p) = 1.627×10^{-27} kg

(7) Velocity of light (c) = 2.998×10^{8} m/sec

(8) Dielectric constant of free space (ε_0) = 8.854×10^{-12} F/m

(9) Permeability of free space (μ_0) = $4\pi \times 10^{-7}$ H/m

(10) Debye Unit = 3.33×10^{-30} coulomb-metre

SECTION I

1. (*a*) Differentiate between ionic and orientational polarization. [8]

(*b*) Explain with a neat sketch photo emissive cell. [8]

P.T.O.

Or

2. (*a*) Differentiate between photo conductive and photo voltaic cell. [8]

(*b*) Explain polar and non-polar materials with examples. [8]

3. (*a*) Write a short note on crystal defects. [9]

(*b*) Explain factors affecting breakdown of solid insulating material. [8]

Or

4. (*a*) Write down properties and applications of the following : [8]

(*i*) Air

(*ii*) Transformer oil

(*iii*) Varnish

(*iv*) Mica.

(*b*) Write properties of insulating materials used in Capactitors and Cables. [9]

5. (*a*) What is Curie temperature ? Explain ferro-magnetic behaviour below critical temperature. [9]

(*b*) In a material, on application of magnetic field of 1.8×10^5 A/m causes a magnetic flux density of 0.18 Wb/m^2. Calculate its permeability, susceptibility and magnetization. [8]

Or

6. (*a*) Write a short note on Compact Disc. [8]

(*b*) Differentiate between Permeability and Magnetic Susceptibility. Hence derive relationship between two. [9]

SECTION II

7. Write down properties and applications of Bimetals, Copper Alloys, Solders and Carbon. [16]

Or

8. Describe Superconductors and Thermocouple with their properties and applications. [16]

9. (*a*) Write a short note on Carbon Nano-tubes. [8]

(*b*) Describe carbon molecules and carbon clusters. [8]

Or

10. (*a*) With neat diagrams describe : [8]

(*i*) Nano-wires

(*ii*) Molecular machines.

(*b*) Draw figures of BN Nano-tubes. Explain it. Where are they used ? [8]

11. (*a*) Describe measurement of Dielectric Strength of Solid Insulating Material with reference to IS 2584. [9]

(*b*) What is sphere gap voltmeter ? What is its use ? Explain. [9]

Or

12. (*a*) Explain measurement of Tangent of Dielectric Loss Angle (tan δ) by Schering Bridge IS 13585-1994. [9]

(*b*) Explain the various tests conducted on High Voltage Bushings. [9]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

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S.E. (Electrical) (I Sem.) EXAMINATION, 2015

ANALOG AND DIGITAL ELECTRONICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw and explain input and output characteristics of CB and CE configuration BJT amplifier. [9]

(*b*) Explain Push Pull amplifier with a neat circuit diagram. [9]

Or

2. (*a*) What is difference between AC and DC load line ? Derive equation for DC load line. [9]

(*b*) What is transfer characteristic of FET ? Construct and explain it. [9]

P.T.O.

3. (*a*) Draw and explain block diagram of an OP-AMP. [8]

(*b*) Explain OP-AMP as a : [8]

(*i*) Schmitt trigger

(*ii*) Comparator.

Or

4. (*a*) Explain : [8]

(*i*) CMRR

(*ii*) Input offset voltage

(*iii*) Slew rate

(*iv*) Amplification factor.

(*b*) Explain OP-AMP as a : [8]

(*i*) Instrumentation amplifier

(*ii*) V-I and I-V converter.

5. (*a*) Draw neat diagram and explain OP-AMP as a Sine wave generator. [8]

(*b*) Draw neat diagram and explain IC 555 as Bistable multivibrator. [8]

Or

6. (*a*) Explain in detail with frequency response curve first order active high pass filter. [8]

(*b*) Explain operation of application of OP-AMP as half wave Precision rectifier. [8]

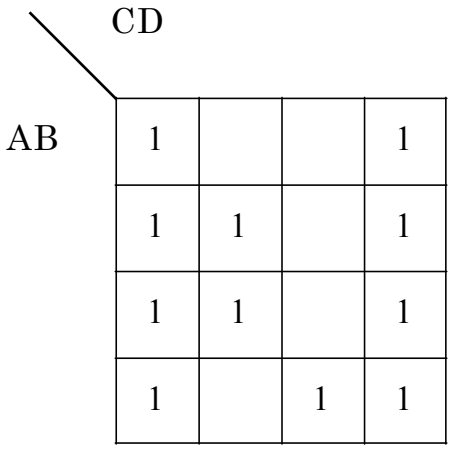
SECTION II

7. (*a*) Explain the Boolean's algebra, DeMorgon's theory and K-map in detail. [8]

(*b*) Explain excess 3 code and gray code. [8]

Or

8. (*a*) Determine the product terms for the karnaugh map and write the resulting minimum SOP expression : [8]



(*b*) Convert the following numbers into its equivalent decimal number : [8]

(*i*) $(1000110)_{BCD}$

(*ii*) $(432.445)_8$

(*iii*) $(A4.2C)_{16}$.

9. (*a*) What is the difference between asynchronous and synchronous counter ? [8]

(*b*) Draw and explain working of 4-bit Johnson's ring counter. [8]

Or

10. (*a*) Explain the operation of JK flip-flop with truth table. What do you mean by race round condition in JK flip-flop ? [8]

(*b*) Explain in detail different types of shift registers along with data movements. [8]

11. (*a*) Give the detailed classification of different types of memories and explain : [9]

(*i*) PROMS

(*ii*) EPROMS

(*iii*) EEPROMS.

(*b*) Implement the following Boolean function using 8 : 1 multiplexer :

$$F(A, B, C) = \Sigma m(1, 3, 5, 6).$$ [9]

Or

12. (*a*) Design and explain 8 : 1 Multiplexer using two 4 : 1 Multiplexer. [9]

(*b*) Explain the ladder type DAC with a neat diagram. [9]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

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S.E. (Electrical) (First Semester) EXAMINATION, 2015

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two sections should be written in separate answer-book.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain construction and working of permanent magnet moving coil instrument. Comment on shape of scale. [10]

(*b*) Which three forces are required for satisfactory operation of an analog indicating instrument ? State the function of each force. [8]

P.T.O.

Or

2. (*a*) With a neat sketch describe construction and working of moving iron, instrument. Derive the torque equation for this instrument. [10]

(*b*) Give detailed classification of measuring instruments. Elaborate each type in brief. [8]

3. (*a*) Explain the working construction of Kelvin's Double Bridge. Derive the expression to find the unknown resistance. [8]

(*b*) Give classification of resistance. State the methods suitable for measurement of resistance for each category. [8]

Or

4. (*a*) Draw circuit diagram of Anderson's bridge. Derive the equation for unknown inductance. [8]

(*b*) Explain the construction and working principle of megger. [8]

5. (*a*) Two wattmeter method is used for measurement of total power in a balanced circuit supplied from 400 V, 3-phase balanced

supply. Calculate the total power, line current, power factor of the load if :

(*i*) Both readings are 4 kW each

(*ii*) Both readings are 4 kW but have opposite signs.

(*iii*) One reading is 4 kW and other reading is zero. [8]

(*b*) Explain two wattmeter method to measure active and reactive power measurement. Draw phasor diagram. [8]

Or

6. (*a*) Draw and explain the construction, working of dynamometer type wattmeter. Also derive its torque equation. [8]

(*b*) With a block diagram explain working of digital frequency meter. [8]

SECTION II

7. (*a*) Explain different types of errors in induction type energy meter. How these errors are compensated ? [8]

(*b*) Describe the construction and working of single-phase induction type energy meter with a neat diagram. Draw the phasor diagram of energy meter showing respective quantities. [10]

Or

8. (*a*) Compare current transformer (CT) and potential transformer (PT). [6]

(*b*) Explain how the following adjustments are made in single-phase induction type of energy-meter :

(*i*) Lag adjustment

(*ii*) Adjustment of friction

(*iii*) Creep. [4×3=12]

9. (*a*) Explain measurement of voltage, current, phase angle and frequency using CRO. [8]

(*b*) Give detailed classification of transducers. [8]

Or

10. (*a*) Explain Pirani gauge for measurement of low pressure. Also state advantages and disadvantages. [8]

(*b*) Explain the following terms associated with CRO : [8]

(*i*) Volts/division

(*ii*) XY-mode

(*iii*) Invert

(*iv*) Time/division.

11. (*a*) Explain construction and working of LVDT with a neat diagram. [8]

(*b*) Explain construction, working and application of load cell with a neat diagram. [8]

Or

12. (*a*) Give detail types of strain gauge. Explain foil strain gauge. [8]

(*b*) Give types of flow and explain construction and working of venturimeter. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-136

S.E. (Electrical Engineering) (Second Sem.) EXAMINATION, 2015

POWER SYSTEM–I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define the following terms associated with generating stations : [8]

(*i*) Load factor

(*ii*) Demand factor

(*iii*) Diversity factor

(*iv*) Annual plant use factor.

P.T.O.

(*b*) The load on a power plant on a typical day is : [8]

Time	**Load (MW)**
12—6 am	10
6—10 am	30
10 am—6 pm	60
6—10 pm	90
10 pm—12 pm	10

Plot daily load curve and load duration curve. Also find the energy supplied by the plant in 24 hours.

Or

2. (*a*) What are the advantages of interconnected operation of power system ? [8]

(*b*) The load on a power plant on a typical day is as under : [8]

Time	**Load (MW)**
12—5 am	30
5—9 am	50
9 am—6 pm	90
6 pm—10 pm	120
10 pm—12 pm	30

Plot the chronological load curve and load duration curve. Find the energy supplied by the plant in 24 hours.

3. (*a*) Derive the expression for voltage distribution across the units of a string of suspension insulators. Define string efficiency. Name only any *two* methods used for improving the string efficiency. [10]

(*b*) Each line of a three-phase system is suspended by a string of three similar insulators. If the voltage across the line unit is 18 kV, calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is (1/10)th of the capacitance of the insulator itself. Also find the string efficiency. [8]

Or

4. (*a*) Discuss the functions and principle of operation of automatic voltage regulator. Name different types of voltage regulators. [8]

(*b*) Discuss the necessity of excitation system used for alternators. Explain one of the type of excitation system used for alternators in detail. [10]

5. (*a*) Derive an expression for the inductance of a three-phase overhead transmission line when conductors are unsymmetrical spaced but transposed. [8]

(*b*) In a horizontal configuration of a three-phase three wire system, conductors are arranged in one plane and are 4 m apart. The conductor diameter is 2 cm. Considering the length of the line to be 80 km, find the total inductance of the line. Assume complete transposition. [8]

Or

6. (*a*) Derive the expression for internal and external flux linkage of a conductor carrying current and thereafter derive the expression for inductance of a single-phase line. [8]

(*b*) Discuss with reason : [8]

(*i*) The A.C. Resistance of a conductor is more than the D.C. resistance.

(*ii*) Bundled conductor lines have lower inductance than that of a single conductor lines.

SECTION II

7. (*a*) Derive the equation for capacitance per km of a single phase overhead transmission line having distance 'D' between the conductors and '*r*' as the radius of each conductor. [8]

(*b*) Explain the 'Method of Images' in determining the effect of earth on the capacitance calculation for overhead transmission lines. [8]

Or

8. (*a*) Derive the expression for the capacitance per phase of a three-phase overhead transmission line with unsymmetrical spacing of conductors, taking into account the effect of earth. Assume complete transposition. Comment on the effect of earth on the capacitance of the transmission line. [8]

(*b*) A 50 Hz overhead transmission line consisting of three conductors each of diameter 2 cm and spaced 2.5 m. Calculate the capacitance per phase per km for the following arrangement between conductors : [8]

(*i*) Equilateral spacing

(*ii*) Horizontal spacing with transposition.

9. (*a*) Derive the expression for ABCD constants of a long transmission line in hyperbolic form. [10]

(*b*) A three-phase 132 kV transmission line is connected to a 50 MW load at a power factor of 0.85 lagging. The line constants of the 80 km long line are Z = 96 $\angle 78°$ ohm and Y = 0.001 $\angle 90°$ s. Using nominal T-circuit representation, calculate :

(*i*) A, B, C and D constants of the line;

(*ii*) Sending end voltage. [8]

Or

10. (*a*) Express the relationship for the sending end voltage and current in terms of receiving end voltage and current for a medium length transmission line with nominal pi method of representation. Evaluate the generalised circuit constants. [10]

(*b*) The following data refers to a 50 Hz, single-phase transmission line : [8]

Length : 30 km

Load delivered at the receiving end : 6 MW at 0.8 p.f. lagging

Resistance of each conductor : 0.02 Ω/km

Inductance = 0.7 mH/km

The voltage at the receiving end is required to be kept at 11 kV.

Find the sending end voltage.

11. (*a*) Derive an expression for sag in case of an overhead transmission line if the supports are at unequal level. [8]

(*b*) A transmission line has a span of 120 m between level supports. The conductor has a cross-sectional area of 3 cm^2. The tension in the conductor is 2000 kg. If the specific gravity of the conductor is 9.9 gm/cm^3 and wind pressure is 1.5 kg/m length, calculate the sag. Also calculate the vertical sag. [8]

Or

12. (*a*) What are the different factors affecting the sag of a transmission line ? How are the effect of wind and ice loading taken into account while determining the resultant loading of the conductor ? [8]

(*b*) Derive the expression for capacitance of a single core cable. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-137

S.E. (Electrical) (Second Semester)

EXAMINATION, 2015

ELECTRICAL MACHINES—I

(2008 Pattern)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

Section I

1. (*a*) Obtain the condition of maximum efficiency of transformer and thereby the output current. [8]

(*b*) What is autotransformer ? Compare autotransformer with two-winding transformer for the same rating. [8]

P.T.O.

Or

2. (*a*) With neat connection diagram, explain OC and SC test on 1-ph transformer to obtain efficiency and voltage regulation. [8]

(*b*) A 500 kVA, 1-ph transformer has an efficiency of 93% both at full load and half load and p.f. unity. Determine efficiency at 75% of full load and pf = 0.8 laging. [8]

3. (*a*) What is the necessity of parallel operation of transformers. State and explain the conditions to be satisfied for parallel operation of 1-ph transformers. [8]

(*b*) Write short note on tertiary winding of transformer. [8]

Or

4. (*a*) What is V-V connection ? Explain with neat connection diagram. [8]

(*b*) What are the standard connections used for 3-ph transformers ? Explain each and state their applications. [8]

5. (*a*) Draw the construction diagram of D.C. machine, label it and explain each part. [10]

(*b*) 220 V, 4P, d.c. shunt motor has 540 Lap wound armature conductors. It draws a current of 35 A and develops 6 kW. The armature and field winding resistances are 1 Ω and 220 Ω respectively. The flux/pole is 30 mWb. Calculate : [8]

(*i*) Developed torque (T_d)

(*ii*) Shaft torque (T_{sh})

Or

6. (*a*) Obtain the torque equation of DC motor. [6]

(*b*) Draw the power flow diagram of D.C. motor and explain. [6]

(*c*) Compare Lap winding and Wave winding. [6]

Section II

7. (*a*) Sketch and explain torque-Ia characteristics for d.c. shunt and series motor. [8]

(*b*) What is the necessity of starter for D.C. motor ? Draw the diagram for 3-point starter and explain. [8]

Or

8. (*a*) Explain the various methods used for speed control of D.C. series motor. [8]

(*b*) What is commutation ? What are the causes of bad commutation ? Suggest the suitable remedial measures. [8]

9. (*a*) Explain, how the rotating magnetic field is produced, when 3-ph supply is fed to 3-ph symmetrical winding of induction motor. [8]

(*b*) Obtain the relationship between : [8]

(*i*) T_{st}/T_{max}

(*ii*) T_{FL}/T_{max}

Or

10. (*a*) Sketch and explain, family of torque-slip curves of 3-ph induction motor. [8]

(*b*) A 3-ph, 4 pole, 50 Hz induction motor consumes power of 40 kW while running at 1440 rpm. The stator and mechanical losses are 1.4 kW and 0.80 kW respectively. Calculate : [8]

(*i*) rotor Cu loss

(*ii*) mechanical power developed

(*iii*) O/P power

(*iv*) Efficiency

11. (*a*) Explain various methods of speed control of 3-ph induction motor. [10]

(*b*) What is the necessity of starter for 3-ph induction motor ? With suitable connection diagram, explain auto-transformer starter. [8]

Or

12. (*a*) Explain no load test and blocked rotor test to be performed on 3-ph induction motor for circle diagram. Draw the circle diagram and show full load current, torque line, output line, rotor Cu loss, stator loss, max. torque on it. [12]

(*b*) Sketch and explain approximate and exact equivalent circuit of 3-ph induction motor. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-138

S.E. (Electrical) (Second Semester) EXAMINATION, 2015

NETWORK ANALYSIS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answer to the two Sections should be written in separate answer books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain : [8]

(*i*) Dependent and independent sources.

(*ii*) Active and passive networks

(*iii*) Unilateral and bilateral networks

(*iv*) Lumped and distributed networks.

(*b*) Explain the principle of duality. [4]

P.T.O.

(*c*) Determine current I_0 in the circuit shown in Fig. 1. [6]

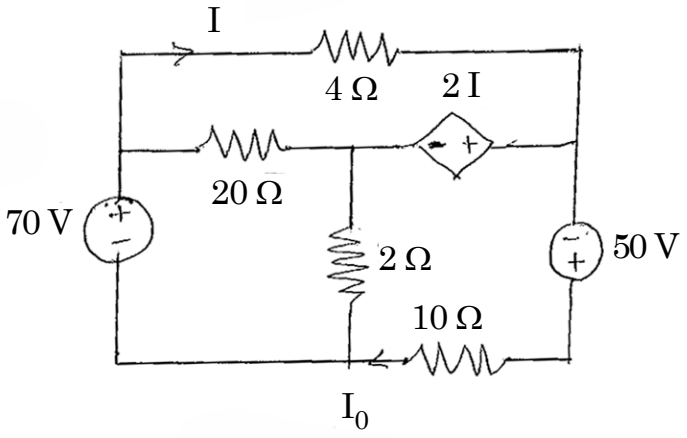


Fig. 1

Or

2. (*a*) Explain the dot convention with suitable example. [4]

(*b*) Explain the concept of Supermesh and Supernode. [4]

(*c*) For the circuit shown in Fig. 2, determine : [10]

(*i*) V_{AB}

(*ii*) V_{AC}

(*iii*) V_{AE}

(*iv*) V_{AD}

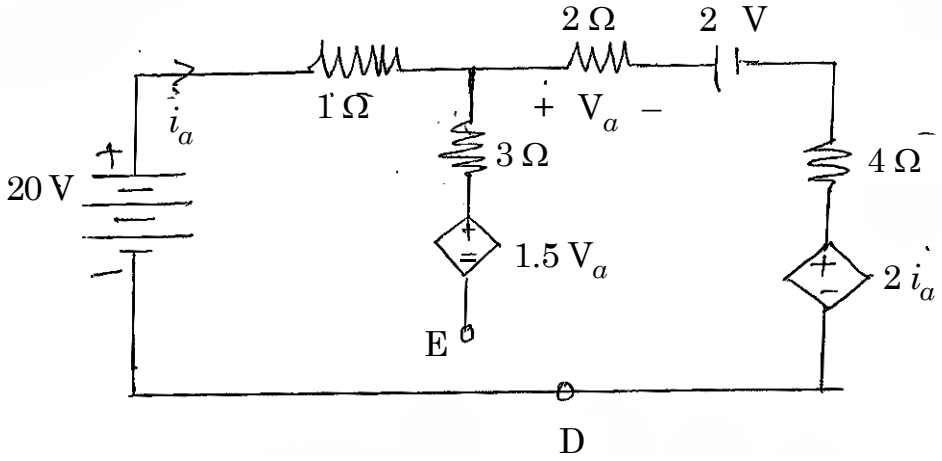


Fig. 2

3. (*a*) Explain Norton's theorem. [8]

(*b*) Use superposition theorem to find current 'I' in the circuit of Fig. 3. [8]

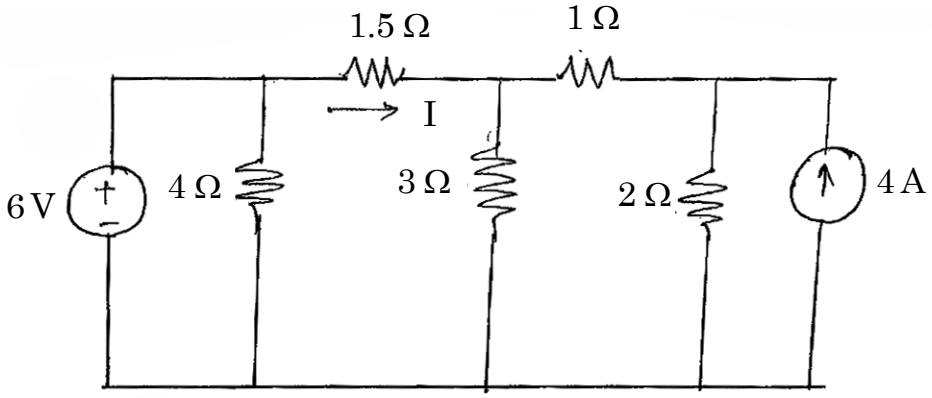


Fig. 3

Or

4. (*a*) Explain Thevenin's theorem with its limitations. [8]

(*b*) Explain reciprocity theorem with suitable example. [8]

5. (*a*) What is the significance of initial condition ? Write a note on initial conditions in basic circuit elements. [8]

(*b*) Explain the behaviour of a series R–L circuit for d.c. excitation. Hence explain time constant for R–L series circuit. [8]

Or

6. (*a*) Explain the behaviour of a series R-C circuit for d.c. excitation. Hence explain time constant for R-C series circuit. [8]

(*b*) Obtain current $i(t)$ for $t \geq 0$ using time domain approach (refer Fig. 4). [8]

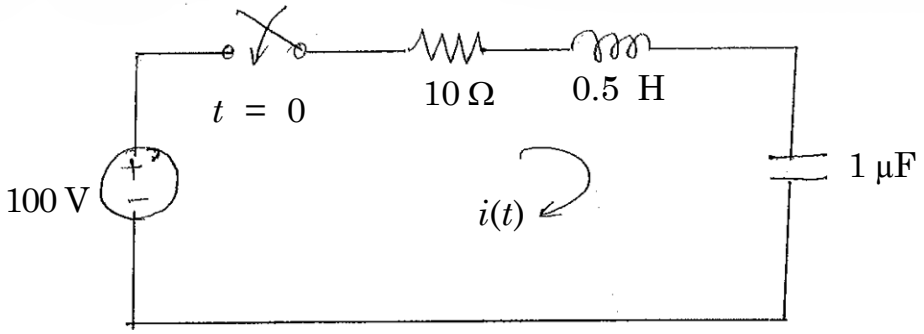


Fig. 4

SECTION II

7. (*a*) Derive interrelation between : [8]

(*i*) Z and Y parameters

(*ii*) Z and h parameters.

(*b*) Determine 'Z' parameters of the network shown in Fig. 5. [10]

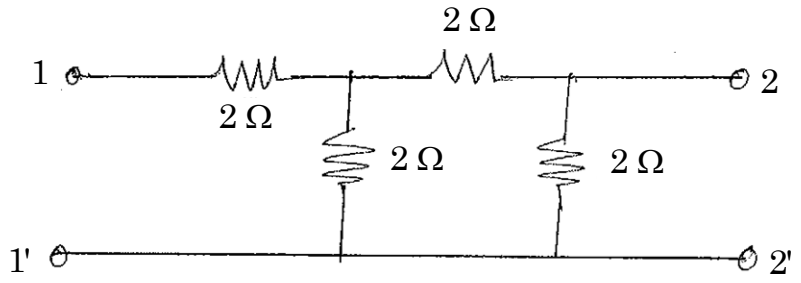


Fig. 5

Or

8. (*a*) Derive the expressions for the energy and power in the inductor when excited by a.c. supply and draw their waveforms. [10]

(*b*) State and explain maximum power transfer theorem for a.c. network. Derive the expression for maximum power transfer. [8]

9. (*a*) Explain : [8]

(*i*) even symmetry

(*ii*) odd symmetry

(*iii*) half wave symmetry

(*iv*) quarter wave symmetry.

(*b*) Explain high pass filter and derive the expression for cut-off frequency for the same in term of L and C. [8]

Or

10. (*a*) Obtain the coefficients of Fourier series for periodic wave. [8]

(*b*) What is low pass filter ? State the expression for cut-off frequency of low pass filter. Also explain : [8]

(*i*) Pass band

(*ii*) Stop band

(*iii*) Cut-off frequency.

11. (*a*) Find the driving point impedance and admittance for 2 port network. [8]

(*b*) Define poles and zeros of a system function. State their significance. [8]

Or

12. (*a*) Find the driving point impedance and admittance for one port network. [8]

(*b*) State the necessary conditions for driving point functions. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-139

S.E. (Electrical) (Second Semester) EXAMINATION, 2015

MICROPROCESSOR FUNDAMENTALS AND APPLICATIONS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What are the functions of microprocessor buses ? [4]

(*b*) Explain the use of different condition flags in 8085 microprocessor. [6]

(*c*) List the features of 8085 microprocessor. [6]

P.T.O.

Or

2. (*a*) Differentiate between memory mapped I/O and I/O mapped I/O. [4]

(*b*) Interface 4 KB of EPROM with starting address from 0000H and 2 KB of RAM with starting address followed by EPROM. [6]

(*c*) Name the different addressing modes with example. [6]

3. (*a*) Distinguish between instruction cycle, machine cycle and clock cycle. [6]

(*b*) Explain the following instructions : [3]

(*i*) LDA 2000H

(*ii*) DAA

(*iii*) CPI data.

(*c*) What is a stack and its uses ? Give and explain in detail the instruction involved in stack operation. [7]

Or

4. (*a*) Write a program to add the contents of memory locations D000H and D001H. Store the result in memory location D002H. [6]

(*b*) List various hardware and software interrupts of microprocessor 8085 along with their addresses. Give their priority. [10]

5. (*a*) Explain interrupt driven data transfer scheme with suitable example. [6]

(*b*) Explain the features of 8251 USART. [6]

(*c*) Explain the type of data transfer techniques used if the speed of I/O devices does not match with speed of micro-processor 8085. [6]

Or

6. (*a*) Explain different register used in 8251 USART. [4]

(*b*) Explain the difference between asynchronous and synchronous serial communication. [6]

(*c*) Draw and explain the block diagram of 8251 USART. [8]

SECTION II

7. (*a*) Draw and explain the functional block diagram of 8255 PPI. [8]

(*b*) Explain control word register format of 8254 and mode 0 operation of 8254. [8]

Or

8. (*a*) Draw functional block diagram of 8254 and explain the function of each block. [8]

(*b*) Write an assembly language program to set and reset PC3 bit after 5 ms. Write delay subroutine for 5 ms delay. [8]

9. (*a*) Explain with block diagram, how power factor is measured using 8085. [8]

(*b*) With the help of interfacing diagram, explain interface of ADC0809 with 8085. [10]

Or

10. (*a*) How is energy measured using 8085, explain with block diagram. [8]

(*b*) Explain DAC interface with 8085 and write an assembly language program to generate triangular wave. [10]

11. (*a*) With the help of interfacing diagram, explain speed measurement using 8085. [8]

(*b*) With the help of interfacing diagram, explain application of 7 segment display using 8085. [8]

Or

12. (*a*) Explain stepper motor control (forward and reverse direction) with the help of interfacing diagram. [8]

(*b*) Explain temperature measurement using 8085. Draw the interfacing diagram. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-140

S.E. (Electrical) (Second Semester) EXAMINATION, 2015

DIGITAL COMPUTATIONAL TECHNIQUES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each section.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) State and explain Descartes' rule of signs with suitable example. [6]

P.T.O.

(*b*) Find the root of the equation :

$$x^4 + 2x^3 - 21x^2 - 22x + 40 = 0$$

using Birge-Vieta method. Assume initial approximation $P_0 = 3.5$. Perform two iterations. [8]

(*c*) Write a short note on numerical instability. [4]

Or

2. (*a*) What is error in numerical computation ? Explain truncation error and round off error with suitable example. [6]

(*b*) State and explain Sturm's theorem. [6]

(*c*) Explain floating point representation of numbers. What is the importance of normalized floating point representation ? [6]

3. (*a*) Explain bisection method to find root of an equation. [8]

(*b*) Using Regula-Falsi method, find a real root of the equation $xe^x - 2 = 0$, take $x_0 = 0$ and $x_1 = 1$. Show 4 iterations. [8]

Or

4. (*a*) Using Newton-Raphson method, find a real root of the equation $xe^x - 2 = 0$, take $x_0 = 0.7$ correct upto 3 decimal places. [8]

(*b*) Explain Chebyshev method for finding root of an equation and derive formula. [8]

5. (*a*) Explain Gauss-Jordan method of solution of linear simultaneous equations. [8]

(*b*) Using Jacobi method solve the following system of linear simultaneous equations. Show 5 iterations. Take $x^{(0)} = y^{(0)} = z^{(0)} = 0$. [8]

$$10x - 5y - 2z = 3$$

$$4x - 10y + 3z = -3$$

$$x + 6y + 10z = -3$$

Or

6. (*a*) Explain Gauss-Seidel iterative method of solution of linear simultaneous equations. [8]

(*b*) Using Gauss elimination method solve the following system of linear simultaneous equations : [8]

$$3x - y + 2z = 12$$

$$x + 2y + 3z = 11$$

$$2x - 2y - z = 2$$

SECTION II

7. (*a*) Derive the formula for Lagrange's Interpolation for unequally spaced data. [8]

(*b*) Given that : [8]

x	f
1	1
3	9
5	25
7	49
9	81

Compute $f(1.5)$, using Newton's forward interpolation formula.

Or

8. (*a*) Fit a straight line to the following data considering y as a dependent variable. [8]

x	f
1	1.5
3	2.8
5	4.0
7	4.7
9	6.0

(*b*) Derive Newton's Backward Difference Interpolation formula. [8]

9. (*a*) Explain modified Euler's method for solution of ordinary differential equation. [8]

(*b*) Find the value of y at $x = 0.1$ for the equation $\frac{dy}{dx} = 1 + xy$ and $y(0) = 1$. Take step size = 0.1 by Taylor series method. [8]

Or

10. (*a*) What are predictor corrector methods ? Write the predictor and corrector formulae of Adam's Bashforth method and Milne Simpson method. [8]

(*b*) Find the value of y at $x = 4$ for the equation $\frac{dy}{dx} = x - y^2$ and $y(0) = 1$. Take step size = 1 by Euler's method. [8]

11. (*a*) Derive Newton Cote's Quadrature formula for numerical integration. From the same derive trapezoidal rule for numerical integration. [9]

(*b*) Integrate using Simpson's 1/3 rule and Simpson's 3/8 rule, taking $h = 1$: [9]

$$\int_0^4 e^x \, dx .$$

Or

12. (*a*) From the following table find the value of :

$$\frac{dy}{dx} \text{ and } \frac{d^2x}{d^2y}$$

at point $x = 5$ and $x = 5.3$. [10]

x	f
5	6.2146
5.1	6.2344
5.2	6.2538
5.3	6.2729

(*b*) Derive an expression for finding 1st and 2nd order differentiation using Newton's backward difference interpolation formula for equal interval data points. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+2**

Seat No.	

[4757]-141

S.E. (E & TC, Electronics) (Second Semester) EXAMINATION, 2015

ENGINEERING MATHEMATICS–III

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q. No. **5** or Q. No. **6** from Section I and Q. No. **7** or Q. No. **8**, Q. No. **9** or Q. No. **10**, Q. No. **11** or Q. No. **12** from Section II.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (A) Solve the following (any *three*) : [12]

(*i*) $(D^3 - D^2 + 4D - 4)\,y = e^x$

P.T.O.

(*ii*) $(D^2 - 1)\, y = x \sin 3x$

(*iii*) $(D^2 + 1)\, y = \text{cosec } x$ (by method of variation of parameters).

(*iv*) $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 5y = x^2 \sin (\log x)$.

(B) Solve :

$$\frac{dy}{dt} = x - 2 ;$$

$$\frac{dx}{dt} = y + 2$$

subjected to conditions $x = 0$ and $y = 0$, when $t = 0$. [5]

Or

2. (A) Solve the following (any *three*) : [12]

(*i*) $(D^2 + 9)\, y = \sin 4x$

(*ii*) $(D^2 + 2D + 1)\, y = x$

(*iii*) $(1 + x)^2 \frac{d^2y}{dx^2} + (1 + x) \frac{dy}{dx} + y = 4 \sin \log (x + 1)$

(*iv*) $\frac{d^2y}{dx^2} + y = 3 \tan x$

(by method of variation of parameters).

(B) A circuit consists of an inductance of 2 henrys, a resistance of 4 ohms and capacitance of 0.05 farads. If $q = i = 0$ at $t = 0$, find charge q and current i at any time t. [5]

3. (A) If $f(z) = u + iv$ is an analytic and

$$u - v = x^3 + 3x^2y - 3xy^2 - y^3$$

find $f(z)$ in terms of z. [6]

(B) Evaluate :

$$\oint_C \frac{\sin 2z}{(z + \frac{\pi}{3})^4} dz$$

where C is $|z| = 3$. [5]

(C) Find bilinear transformation which maps points $z = -1, 0, 1$ onto the points $w = 0, i, 3i$ respectively. [5]

Or

4. (A) If $f(z) = u + iv$ is an analytic function, then prove that :

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |f(z)|^4 = 16 |f(z)|^2 |f'(z)|^2.$$ [5]

(B) Evaluate :

$$\int_C \frac{z}{z^2 + 1} dz$$

where C is $|z + i| = 1$. [5]

(C) Find image of straight line $y = x$ under the transformation :

$$w = \frac{z - 1}{z + 1}.$$ [6]

5. (A) Find z-transform of the following (any *two*) : [6]

(*i*) $f(k) = \frac{3^k}{k!}, \quad k \geq 0$

(*ii*) $f(k) = \sin\left(\frac{k\pi}{4} + \alpha\right), \quad k \geq 0$

(*iii*) $f(k) = k\ 4^k, \quad k \geq 0$.

(B) Find the Fourier integral representation of the function : [6]

$$f(x) = \begin{cases} 1 & , \ |x| < 1 \\ 0 & , \ |x| > 1 \end{cases}$$

and hence evaluate :

$$\int_0^\infty \frac{\sin \lambda \cos \lambda x}{\lambda}\, d\lambda.$$

(C) Solve the difference equation : [5]

$$f(k + 2) + 3\ f(k + 1) + 2\ f(k) = 0,$$

$$f(0) = 0, \ \ f(1) = 2, \ \ k \geq 0.$$

Or

6. (A) Find inverse z-transform of the following (any *two*) : [8]

(*i*) $F(z) = \dfrac{3z^2 + 2z}{z^2 - 3z + 2}, \quad 1 < |z| < 2$

(*ii*) $F(z) = \dfrac{z}{(z - \frac{1}{4})(z - \frac{1}{5})}, \quad |z| > \dfrac{1}{4}$

(*iii*) $F(z) = \dfrac{1}{(z - 2)(z - 3)}$

(by inversion integral method).

(B) Find the Fourier sine transform of $\dfrac{1}{x}$. [4]

(C) Solve the integral equation : [5]

$$\int_0^\infty f(x) \cos \lambda x \, dx = \begin{cases} 1 - \lambda & , \quad 0 \le \lambda \le 1 \\ 0 & , \quad \lambda \ge 1 \end{cases} .$$

SECTION II

7. (A) Find interpolating polynomial passing through the points :

(0, 4), (1, 3), (2, 6).

Use it to find y at $x = 1.5$ and $\dfrac{dy}{dx}$ at 0.5. [5]

(B) Use Simpson's $\frac{1}{3}$rd rule to evaluate

$$\int_0^1 \frac{\sin x}{2 + 3 \sin x}\, dx$$

by dividing the interval into six parts. [5]

(C) Using Modified Euler's method, solve equation :

$$\frac{dy}{dx} = x^2 + y,\ y(0) = 1$$

to calculate y at $x = 0.2$ taking $h = 0.2$. [6]

Or

8. (A) Use Runge-Kutta method of 4th order to solve :

$$\frac{dy}{dx} = (1 + x)\, y\,,$$

subject to the conditions $x = 0$, $y = 1$ to compute y at 0.2 taking $h = 0.2$. [6]

(B) Use Simpson's $\frac{3}{8}$th rule to evaluate :

$$\int_0^{\pi/2} \sqrt{\sin x + \cos x}\, dx$$

taking $h = \frac{\pi}{6}$. [5]

(C) For the following tabulated data :

x	y
0	1
1	1
2	7
3	25
4	61
5	121

Find y at 4.5 using Newton's forward difference interpolation formula. [5]

9. (A) Find the directional derivative of :

$$\phi = 4xz^3 - 3x^2 y^2 z$$

at (2, –1, 2) along a line equally inclined with co-ordinate axes. [6]

(B) If

$$\bar{r} \cdot \frac{d\bar{r}}{dt} = 0$$

then show that $\bar{r}$ has constant magnitude. [5]

(C) Show that the vector field :

$$\bar{F} = (y^2 \cos x + z^2)\,\bar{i} + (2y \sin x)\,\bar{j} + 2xz\,\bar{k}$$

is irrotational and find scalar field ϕ such that $\bar{F} = \nabla\phi$. [6]

Or

10. (A) Show that (any *two*) : [8]

(*i*) $\nabla \cdot \left[r\ \nabla \left(\frac{1}{r} \right) \right] = -\frac{1}{r^2}$

(*ii*) $\nabla \cdot \left(\frac{\bar{a} \times \bar{r}}{r^n} \right) = 0$

(*iii*) $\nabla \times \left(\bar{a} \times \nabla \left(\frac{1}{r} \right) \right) = \frac{\bar{a}}{r^3} - \frac{3(\bar{a} \,.\, \bar{r})\,\bar{r}}{r^5}$.

(B) If directional derivative of

$$\phi = ax^2y + by^2z + cz^2x$$

at (1, 1, 1) has maximum magnitude 15 in the direction parallel to :

$$\frac{x-1}{2} = \frac{y-3}{-2} = \frac{z}{1},$$

hence find the values of a, b, c. [5]

(C) Prove that :

$$\bar{F} = \frac{x\bar{i} + y\bar{j}}{x^2 + y^2}$$

is solenoidal. [4]

11. (A) Find work done by the force :

$$\bar{F} = (x^2 - yz)\bar{i} + (y^2 - zx)\bar{j} + (z^2 - xy)\bar{k}$$

in taking a particle from (1, 1, 1) to (3, –5, 7). [5]

(B) Evaluate :

$$\iint_S (x^3\bar{i} + y^3\bar{j} + z^3\bar{k}) \cdot \hat{n}\, ds$$

where s is the surface of the sphere $x^2 + y^2 + z^2 = 1$. [6]

(C) Use Stokes' theorem to evaluate :

$$\int_C \bar{F} \cdot d\bar{r}, \text{ where } \bar{F} = xy^2\bar{i} + y\bar{j} + z^2x\,\bar{k}$$

for the surface of rectangular lamina bounded by

$$x = 0,\ y = 0,\ x = 1,\ y = 2,\ z = 0.$$ [6]

Or

12. (A) Use Maxwell's equations :

$$\nabla \bullet \bar{E} = 0\,, \quad \nabla \bullet \bar{H} = 0\,, \quad \nabla \times \bar{E} = -\frac{\mu}{C}\frac{\partial \bar{H}}{\partial t}\,, \quad \nabla \times \bar{H} = \frac{K}{C}\frac{\partial \bar{E}}{\partial t}$$

to show that both $\bar{E}$ and $\bar{H}$ satisfy wave equation :

$$\nabla^2 \bar{A} = \frac{\mu K}{C^2}\frac{\partial^2 \bar{A}}{\partial t^2}\,. \qquad [6]$$

(B) Using Green's theorem evaluate :

$$\int_C x^2\,dx + xy\,dy$$

over the region R enclosed by $y = x^2$ and the line $y = x$. [6]

(C) Prove that :

$$\iint_S (\phi \nabla \psi - \psi \nabla \phi) \bullet d\bar{s} = \iiint_V (\phi \nabla^2 \psi - \psi \nabla^2 \phi)\,dV\,. \qquad [5]$$

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4757]-142

S.E. (Electronics/E&TC) (First Semester) EXAMINATION, 2015

SOLID STATE DEVICES AND CIRCUITS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the *two* sections should be written in separate answer books.

(*ii*) Answer any *three* questions from each Section.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What are the features of switching diodes ? Draw the characteristics of switching diode and mention application of switching diode. [8]

P.T.O.

(*b*) Calculate IF for the Si diode circuit shown in Fig. 1 for r_d = 0 and then recalculate the current taking r_d = 0.25 Ω. [4]

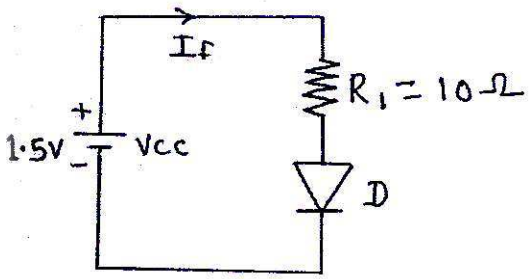


Fig. 1

(*c*) Define D.C. load line and Q point of diode circuit and list the factors which affect Q point on D.C. load line. [4]

Or

2. (*a*) The *n* channel E-MOSFET has the following parameters : [8]

V_{GS} = 3 V, V_T = 1 V, λ = 0.03/V, K = 0.15 mA/V^2, V_{DS} = 8 V.

Calculate :

(*i*) Drain current

(*ii*) The output resistance.

(*b*) Why are MOSFETs used as VLSI device ? [4]

(*c*) While handling CMOS devices, what precaution should be taken ? [4]

3. (*a*) Compare between tranistor BJT and MOSFET. [8]

(*b*) Determine I_{DQ}, V_{GSQ} and V_{DSQ} for the circuit shown in Fig. 2 with $V_{GS(TH)}$ = 5 V, $I_{D(ON)}$ = 3 mA and $V_{GS(ON)}$ = 10 V. [10]

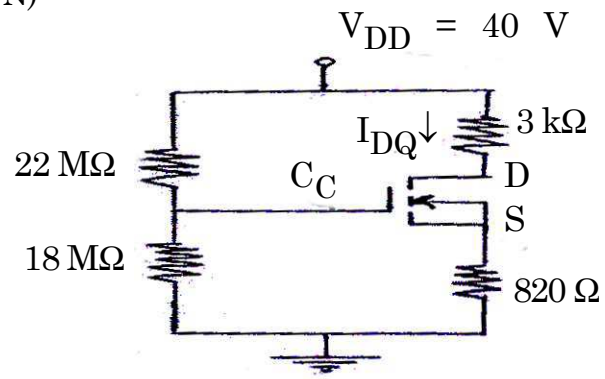


Fig. 2

Or

4. (*a*) For Common Source Amplifier circuit shown in Fig. 3. Determine g_m, r_o, A_v, R_i, R_o. Given V_T = 1.2 V, K = 0.48 mA/V^2, λ = 0.012/V. [10]

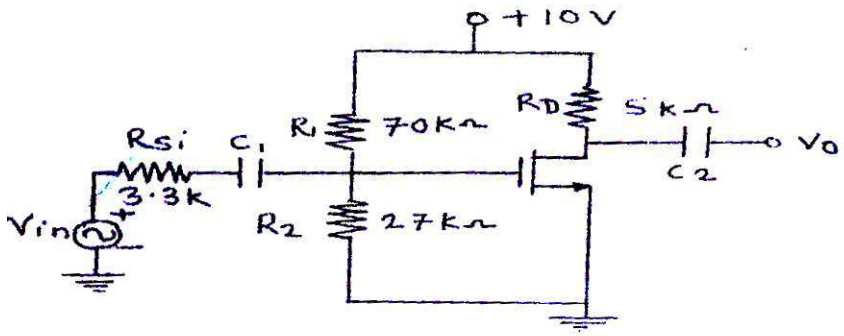


Fig. 3

(*b*) Define : [8]

(*i*) Threshold voltage

(*ii*) Trans-conductance

(*iii*) Drain resistance

(*iv*) Conduction parameter.

5. (*a*) Draw the small signal equivalent circuit of BJT using *h*-parameters for common emitter configuration. Explain the significance of each parameter with formulae. State benefit of *h*-parameter. [8]

(*b*) For the circuit shown in Fig. 4, find I_{BQ}, I_{CQ} and V_{CEQ}, for $\beta = 150$. [8]

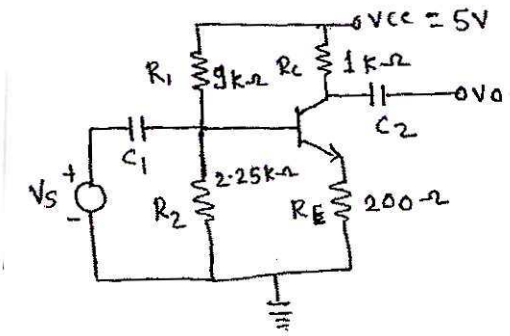


Fig. 4

Or

6. (*a*) For the circuit shown in Fig. 5, calculate the A_i, A_v, A_{vs}, R_i and R_o. The *h*-parameters are h_{ie} = 1.1 kΩ, h_{fe} = 50, $h_{re} = 2.5 \times 10^{-4}$ and h_{oe} = 25 μA/V. [10]

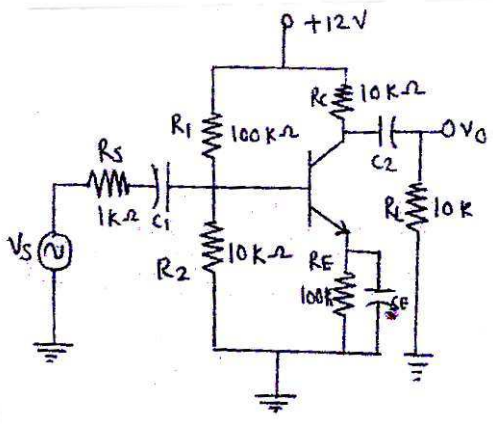


Fig. 5

(*b*) What is thermal runaway in BJT ? Derive the condition for thermal stability. [6]

SECTION II

7. (*a*) What is significance of frequency response ? Explain the effect of various capacitor listed below on frequency response of an amplifier. [8]

(*i*) Coupling capacitor

(*ii*) Bypass capacitor

(*iii*) Junction capacitor.

(*b*) Draw hybrid Π CE amplifier model at high frequency. Explain the significance of each parameter. [8]

Or

8. (*a*) The following low frequency parameter are known for a given transistor at IC = 10 mA, V_{CE} = 10 V at room temperature, h_{fe} = 100, h_{ie} = 500 Ω, h_{re} = 10^{-4}, h_{oe} = 10^{-5} A/V at same operating point F_T = 50 MHz, C_c = 3 P_F. Compute the value of all the hybrid Π parameters and value of C_e. Draw the equivalent circuit. [10]

(*b*) Explain the following term : [6]

(*i*) Gain—BW product

(*ii*) Effect of multistage amplifier on the BW

(*iii*) Need of multistage amplifier.

9. (*a*) What are the *four* basic amplifier types ? Explain with the help of a block diagram in detail. What are the desirable characteristics of four basic amplifiers ? [10]

(*b*) Explain Colpitt oscillator and calculate frequency of oscillations of Colpitt oscillator with C1 = C2 = 600 Pf and L = 2 MHz. [8]

Or

10. (*a*) The circuit shown in Fig. 6, has the following parameters : R_C = 4 kΩ, R_f = 40 kΩ, R_S = 10 kΩ. [12]

h_{ie} = 1.1 k, h_{fe} = 50, h_{re} = h_{oe} = 0.

Find :

(*i*) β

(*ii*) R_M

(*iii*) R_{MF}

(*iv*) A_{Vf}

(*v*) R_{if}

(*vi*) R'_{of}

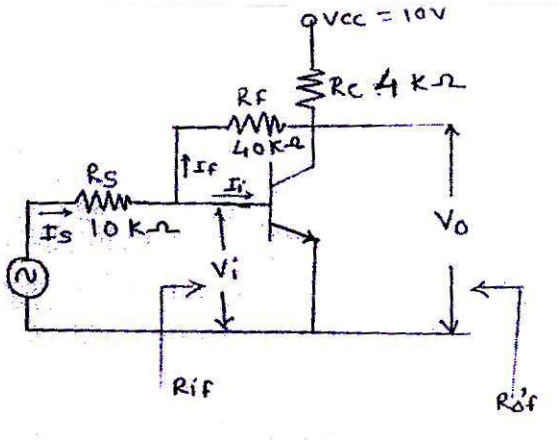


Fig. 6

(*b*) State the criteria to be satisfied which makes the amplifier to be used as oscillator. [6]

11. (*a*) Explain the construction of power BJT. Draw and explain I-V characteristics of power BJT in different modes. [8]

(*b*) The power amplifier delivers 50 watts output at 50% efficiency. The ambient temperature of 25°C. If the maximum allowable junction temperature is 150°C, then calculate : [8]

(*i*) Power dissipation

(*ii*) Maximum thermal resistance.

Or

12. (*a*) Explain in brief : [8]

(*i*) Why impedance matching is required in power amplifier ?

(*ii*) Why can *h*-parameters not be used for the analysis of power amplifier ?

(*b*) A power transistor operating in class A transformer coupled circuit is to be delivered 4 watts of power into 4 Ω load. The Q point is adjusted for symmetrical current swing

V_{cc} = 18 V, assume ideal characteristic and V_{min} = 0, calculate : [8]

(*i*) Turns ratio of output transformer

(*ii*) Peak collector current

(*iii*) Q-point coordinates

(*iv*) Collector circuit efficiency.

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+2**

Seat No.	

[4757]-143

S.E. (Electronics/E & TC) (First Semester) EXAMINATION, 2015

NETWORK ANALYSIS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic table, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Using Kirchhoff's law, determine current i_1 for the circuit shown in Fig. 1 [6]

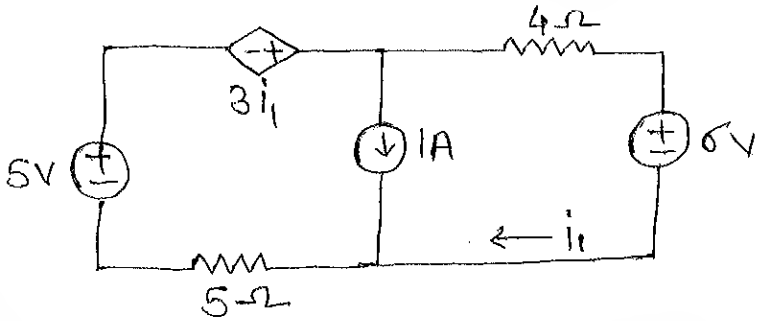


Fig. 1

P.T.O.

(*b*) For the circuit given in the Fig. 2, find the branch current I_1, I_2, I_3 and node voltages V_1 and V_2. [6]

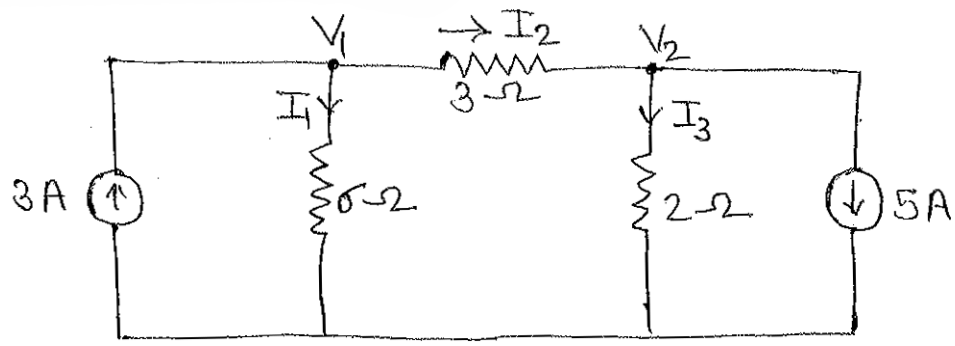


Fig. 2

(*c*) State and explain maximum power transfer theorem for d.c. circuit. [6]

Or

2. (*a*) Obtain the current I_x by Thevenin's theorem (Refer Fig. 3 : [6]

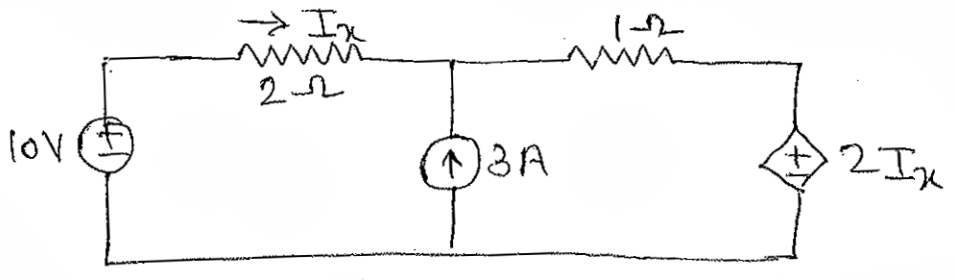


Fig. 3

(*b*) Using source transformation, find V_1 and V_2 in the circuit shown in Fig. 4. [6]

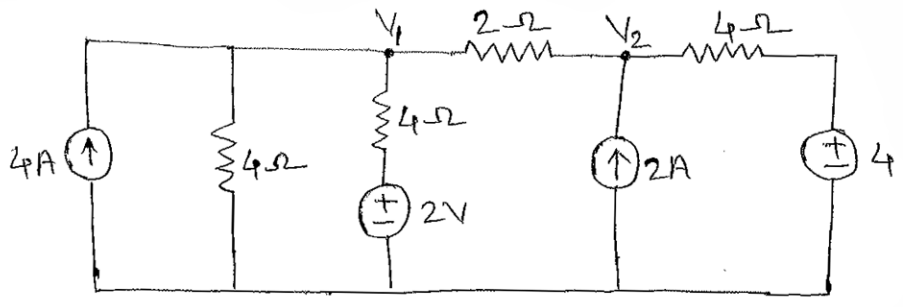


Fig. 4

(*c*) For the circuit shown in Fig. 5 make use of principle of superposition to determine i_1, i_1, V_1 and V_2. [6]

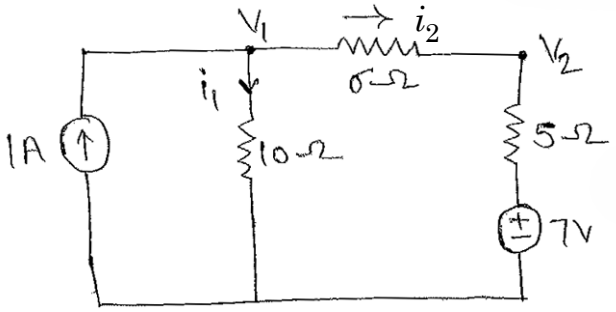


Fig. 5

3. (*a*) Prove that resonance frequency is geometric mean of two half power frequencies. [6]

(*b*) In series RLC circuit L =120 μH and R = 18 Ω. It is resonant at 1 MHz and connected to generator of 1 V (0 Ω, 1 MHz)

(*i*) What is the voltage across capacitor ?

(*ii*) What current flows at resonance ? [6]

(*c*) Define and explain Q-factor of resonating circuit. [4]

Or

4. (*a*) Draw the circuit for series resonance and derive the expression for resonant frequency. [4]

(*b*) A 50 Ω resistance is connected in series with inductor having internal resistance R, capacitance and 100 V variable frequency supply at frequency of 200 Hz; maximum current of 0.7 A flows and voltage across capacitor is 200 V. Determine circuit components. (Refer Fig. 6) [6]

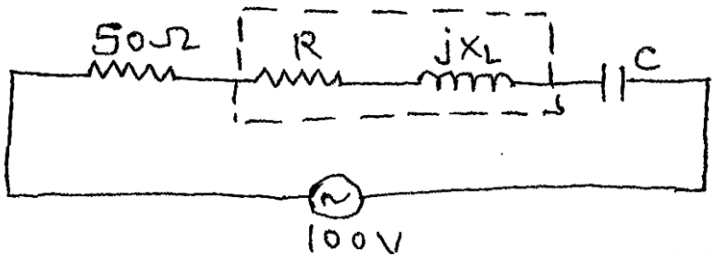


Fig. 6

(*c*) Find the value of 'L' for which the circuit shown in Fig. 7 is resonant at a frequency of ω_0 = 1000 rad/sec. [6]

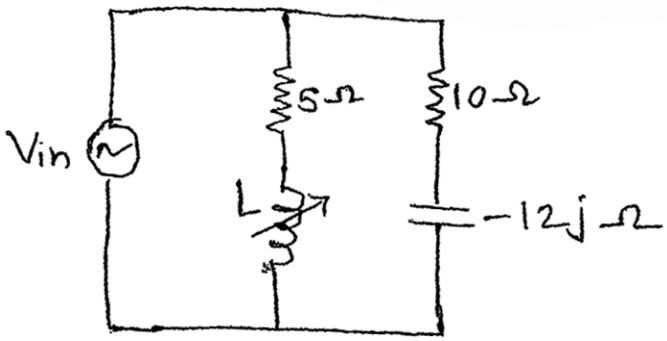


Fig. 7

5. (*a*) Derive the relationship between Neper and Decibels. [4]

(*b*) Design constant k-type low pass filter using T-section which have cut-off frequency of 5 kHz and to work in to characteristic impedance of 600 Ω. Calculate attenuation and phase shift at frequency of 6 kHz. [6]

(*c*) Design symmetrical T attenuator with attenuation of 20 dB and design impedance of 600 Ω. [6]

Or

6. (*a*) An attenuator is composed of symmetrical π-section having series arm of 275 Ω and each shunt arm of 450 Ω. Find :

(*i*) The characteristic impedance of the network

(*ii*) Attenuation provided by section. [6]

(*b*) Design constant k-type high pass filter π-section to work in to R_0 = 500 Ω and cut-off frequency of 1 kHz. For this filter, calculate :

(*i*) Phase angle B at frequency of 1.5 kHz

(*ii*) Attenuation α in neper at frequency 0.9 kHz. [6]

(*c*) Explain the concept of iterative impedance and image impedance of an asymmetrical network. [4]

SECTION II

7. (*a*) State for Laplace transform :

(*i*) Initial value theorem

(*ii*) Final value theorem. [4]

(*b*) The circuit shown in Fig. 8 was in steady state with switch on position 'A'. At $t = 0$ it is moved to position 'B'. Find $i(t)$ using Laplace transform. [6]

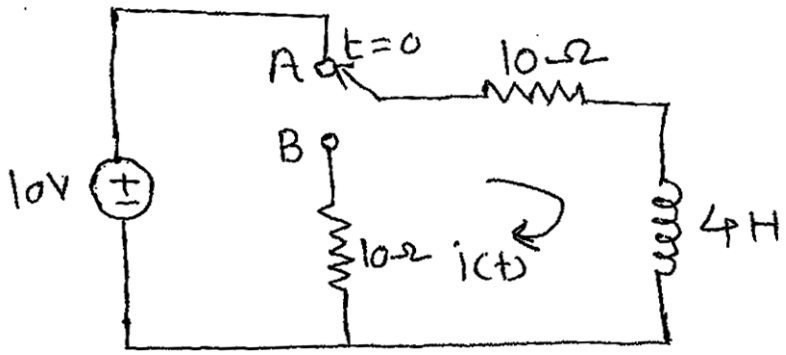


Fig. 8

(*c*) A series RC circuit fed with d.c. voltage source as shown in Fig. The switch 'S' is closed at time $t = 0$. Draw the

Laplace transformed circuit and find out expression for current through the circuit (Refer Fig. 9) : [6]

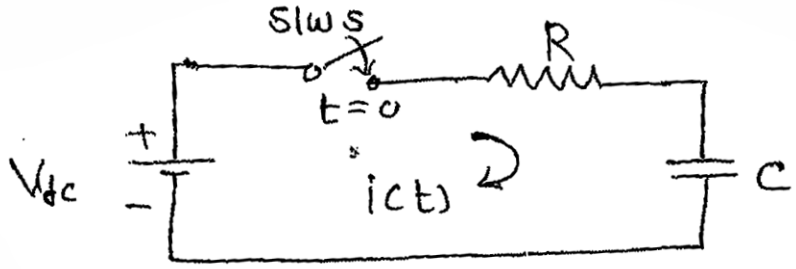


Fig. 9

Or

8. (*a*) State any *four* properties of Laplace transform. [4]

(*b*) In the Fig. 10, the switch is moved from position 'A' to position 'B', at t = 0. Just before the switching position 'B', the initial conditions are $i_L(0^-)$ = 2 A and V_C (0^-) = 2 V. Find current $i(t)$ after switching. [6]

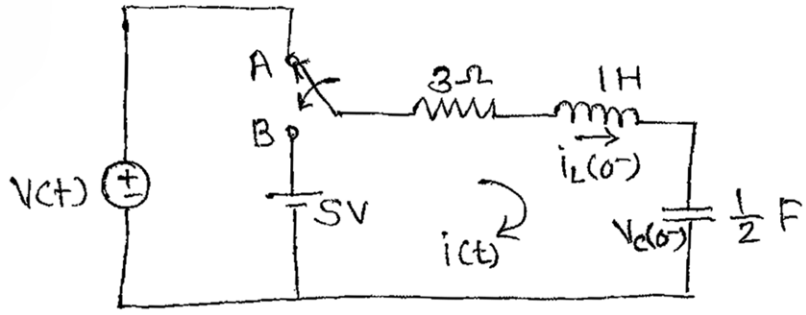


Fig. 10

(*c*) In the network shown in Fig 11, the switch 'k' is moved from position '*a*' to position '*b*' at $t = 0$. Find expression for $i(t)$ using Laplace transform method : [6]

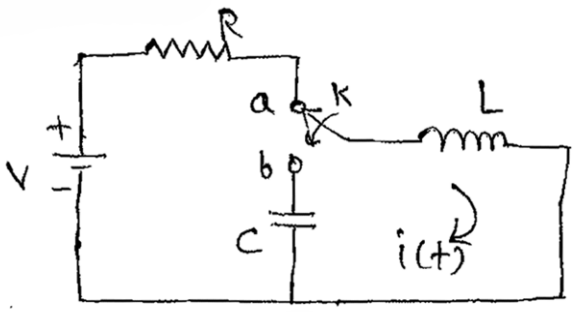


Fig. 11

9. (*a*) Obtain Z parameter in terms of *h* parameters. [6]

(*b*) Show that for series connected two port networks the overall *z*-parameters is equal to the addition of individual *z*-parameters of the two networks. [6]

(*c*) Determine *h*-parameters for the following network (refer Fig. 12) : [6]

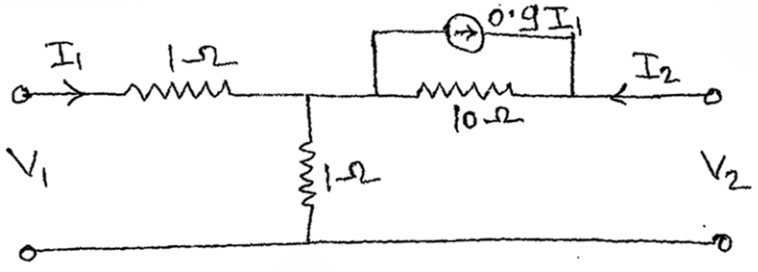


Fig. 12

Or

10. (*a*) Derive the condition of reciprocity and symmetry for *y*-parameters. [6]

(*b*) State necessary conditions for driving point functions. [6]

(*c*) Find *y* and *z*-parameters for the following network (Refer Fig. 13) : [6]

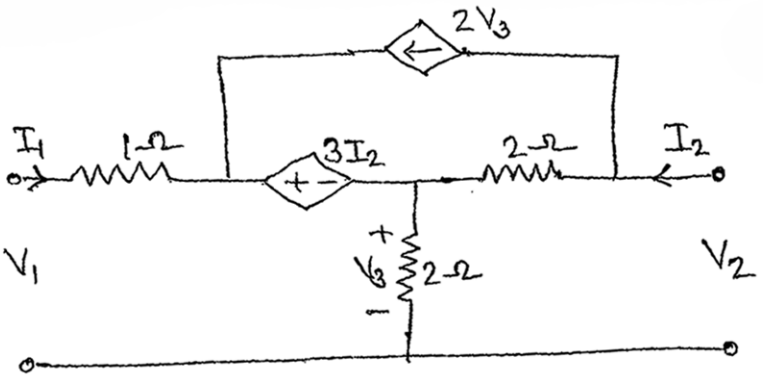


Fig. 13

11. (*a*) Derive the relation for Z_0 and γ in terms of primary constants of transmission line. [6]

(*b*) The characteristic impedance of a uniform transmission line is 2039.5 Ω at frequency of 800 Hz. At this frequency, the propagation constant is 0.054 ∠87.9°. Determine the value of R and L. [6]

(*c*) Derive the relation between Standing wave ratio (SWR) and Reflection coefficient (K). [4]

Or

12. (*a*) The primary constants of a line working at 1 MHz are :

$R = 10.4\ \Omega/km$

$L = 0.00367$ H/km

$G = 0.8 \times 10^{-6}$ mho/km

$C = 0.00835 \times 10^{-6}$ F/km.

Calculate the values of Z_0 and β. [6]

(*b*) An RF line has a characteristic impedance of 50 ohm. It is terminated into a load impedance of $(75 + j\ 75)$ ohm. Determine reflection coefficient and standing wave ratio. [6]

(*c*) Give the list of primary and secondary constants for transmission line. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-144

S.E. (E&TC/Electronics) (I Sem.) EXAMINATION, 2015

DIGITAL LOGIC DESIGN

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) In Section I : Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**.

(*vi*) In Section II : Attempt Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

SECTION I

1. (*a*) Design 4-bit BCD adder using binary adder ICs. [9]

(*b*) Implement Full-Adder using suitable De-MUX. [9]

Or

2. (*a*) Simplify the following Boolean function by using Quine-McClusky method : [10]

$F(A, B, C, D) = \Sigma m(0, 1, 3, 7, 8, 9, 11, 15)$.

(*b*) Design 4 : 1 multiplexer using only NAND gates. [8]

P.T.O.

3. (*a*) Explain D-FF and state why D-FF is called as data latch. [8]

(*b*) Design and implement 3-bit Asynchronous up-counter using T-FF. [Use negative edge triggered clock signal.] [8]

Or

4. (*a*) Explain any *two* applications of Shift Register. [8]

(*b*) Design and implement synchronous Decode Counter. [8]

5. (*a*) Describe different modeling styles of VHDL with suitable example. [8]

(*b*) Write VHDL code for simple 4 : 1 MUX. [4]

(*c*) What is the difference between sequential and concurrent execution of VHDL statements ? [4]

Or

6. (*a*) Write VHDL code for Mod-6 counter. [8]

(*b*) Write VHDL code for 4-Bit synchronous counter. [8]

SECTION II

7. (*a*) Draw 3-bit up-down ripple counter having mode control input M :

M = 0 up-counter

M = 1 down-counter. [8]

(*b*) Design a divide by 100(MOD – 100) counter using IC 7490. [10]

Or

8. (*a*) Design a sequence generator to generate the following pulse train using shift Register 11001110. [10]

(*b*) What is lockout condition ? How to avoid lockout condition ? [8]

9. (*a*) Explain the difference between current sourcing and current sinking in TTL logic. [8]

(*b*) Explain the following characteristics of CMOS logic family :

(*i*) Noise Margin

(*ii*) Fan out

(*iii*) Power dissipation

(*iv*) Static sensitivity. [8]

Or

10. (*a*) Draw and explain the working of 2-input TTL NAND gate. [8]

(*b*) Compare CMOS and TTL logic. [8]

11. (*a*) A combinational logic is defined by functions :

$$F_1(A, B, C) = \Sigma m(3, 5, 6, 7)$$

$$F_2(A, B, C) = \Sigma m(0, 2, 4, 7)$$

Implement the circuit with PLA having 3 i/ps, 4 product terms and two outputs. [8]

(*b*) Compare PROM, PLA and PAL. [8]

Or

12. (*a*) Write a short note on PROM, EPROM and EEPROM. [8]

(*b*) Classify semiconductor memory and explain the differences between SRAM and DRAM. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-145

S.E. (E&TC/Electronics (First Semester) EXAMINATION, 2015

POWER DEVICES AND MACHINES

(2008 Pattern)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**. Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to two sections should be written in separate answer-book.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain reverse recovery characteristics of power diode. Derive the expression for t_{rr} and I_{RR}. [9]

(*b*) Draw isolated gate drive circuit for MOSFET and explain the operation. [9]

Or

2. (*a*) Draw and explain switching characteristics of MOSFET. [9]

(*b*) Explain forward and reverse bias safe operating area in power IGBT. [9]

P.T.O.

3. (*a*) Explain with neat diagram line synchronised UJT oscillator. Draw the necessary waveforms. [8]

(*b*) What is GTO ? What is difference between SCR and GTO. Explain turn-off mechanism of GTO. [8]

Or

4. (*a*) What are different design considerations of gate drive circuit of SCR ? Explain any *one* method of triggering of SCR with neat diagrams. [8]

(*b*) Design UJT triggering circuit with the following data :

R_{BB} = 5 kΩ, η = 0.72, I_P = 0.6 mA, Vp = 18 V, V_V = 1V I_U = 2.5 mA. $I_{leakage}$ = 4.2 mA, frequency of pulses is 2 kHz and capacitor (C) = 0.04 μF. [8]

5. (*a*) Explain the following modes of single-phase fully controlled converter (R-L load) with neat diagrams : [8]

(*i*) Rectifying mode

(*ii*) Inversion mode.

(*b*) A single-phase semiconverter operated from 120 V, 50 Hz and the load resistance = 10 Ω. If the average voltage is 25% of maximum possible average output voltage, calculate : [8]

(*i*) Delay angle (α)

(*ii*) RMS and average output current.

Or

6. (*a*) Draw and explain the operations of single-phase full wave A.C. voltage controller with 'R' load, using S.C.R. By taking $\alpha = 30^{o}$, draw voltage and current waveforms. [8]

(*b*) A single-phase half wave A.C. voltage controller has resistive load R = 5 ohm, Input voltage V_S = 120 V, 60 Hz. The delay angle of Thyristor $\alpha = 60^{o}$. Determine : [8]

(*i*) RMS output voltage (V_{orms})

(*ii*) Input power factor (PF)

(*iii*) Average input current I_0(avg).

SECTION II

7. (*a*) Explain the operation to step down chopper with neat diagram. Derive the expression of average and RMS output voltage $V_{o(rms)}$. [9]

(*b*) Explain with block schematics, working of off-line UPS and online UPS. [9]

Or

8. (*a*) Explain single-phase bridge Inverter for R-L load with neat circuit diagram and waveforms. [9]

(*b*) Explain 180^{o} mode in three-phase bridge inverter for 'R' load with neat circuit diagram, waveforms and equivalent circuits. [9]

9. (*a*) Explain construction of D.C. motor with neat diagram. [8]

(*b*) Draw and explain torque speed characteristics of D.C. shunt motor. [8]

Or

10. (*a*) Discuss briefly the different methods of speed control of three-phase induction motor. [8]

(*b*) Explain construction, working and characteristics of universal motor. [8]

11. (*a*) Draw and explain various types of three-phase transformer connection along with relation between phase and line voltages and currents. [8]

(*b*) Explain construction and working of AC servomotor. [8]

Or

12. (*a*) Explain construction, working and characteristics of BLDC motor. [8]

(*b*) State various protection methods for motors. Explain field failure protection method for d.c. motor in detail. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-146

S.E. (Electronics/Electronics & Telecommunication)

(Second Semester) EXAMINATION, 2015

INTEGRATED CIRCUITS AND APPLICATIONS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Derive the expression for A_d, R_i and R_o for dual input balanced output difference amplifier using *r*-parameters. Draw the small signal model for the same. [10]

(*b*) With neat diagram explain the necessity and working of current mirror. [8]

P.T.O.

Or

2. (*a*) The following specifications are given for dual input balance output difference amplifier : [8]

R_c = 2.2 kΩ, R_E = 4.7 kΩ, Rin_1 = Rin_2 50 Ω,

+ V_{CC} = 10 V, $-V_{EE}$ = –10 V, $\beta_{ac} = \beta_{dc}$ = 100,

V_{BE} = 0.715 V.

Determine :

(*i*) Operating point i.e. I_{CQ} and V_{CEQ}

(*ii*) Voltage gain

(*iii*) Input resistance

(*iv*) Output resistance.

(*b*) State the values for all ideal parameters of Op-amp. [5]

(*c*) State different Op-amp technologies and compare them. [5]

3. (*a*) Define and explain the following terms with respect to Op-amp : CMRR, PSRR, Slew rate, Gain bandwidth product. [8]

(*b*) What is the need of frequency compensation ? State and explain any *one* method of external frequency compensation. [8]

Or

4. (*a*) What are the different types of noise that are associated with Op-amps ? Draw Op-amp noise model and give expression for output noise voltage. [8]

(*b*) Explain the effect of temperature on : [8]

(*i*) Input bias current

(*ii*) Input offset current

(*iii*) Input offset voltage

(*iv*) Output offset voltage.

5. (*a*) What are problems associated with the ideal integrator ? Draw neat circuit diagram of practical integrator and explain its operation with its frequency response. [8]

(*b*) Draw and explain different amplifiers using Op-Amp and obtain the expression for output voltage. [8]

Or

6. (*a*) Design a practical differentiator having unity gain at 150 Hz. [8]

(*b*) Draw a neat diagram of inverting summing amplifier with three inputs and obtain the expression for output voltage. [8]

SECTION II

7. (*a*) Draw and explain sample and hold circuit using Op-amp. [4]

(*b*) Draw and explain three Op-amp instrumentation amplifier. Derive the expression for its output voltage. [10]

(*c*) Explain the zero crossing detector using Op-amp with necessary waveform. [4]

Or

8. (*a*) Explain the necessity of precision rectifier with neat circuit diagram. Explain the operation of full wave precision rectifier. [10]

(*b*) Explain the working of inverting Schmitt trigger. Also derive the equation for the trigger points. [8]

9. (*a*) State the specifications of ADC. Also explain the applications of ADC. [8]

(*b*) Draw neat diagram and V to F convertor and explain its operations. [8]

Or

10. (*a*) Calculate output voltage of 8-bit DAC for digital input 10000000 and 11011101 with reference voltage of 10 V. [8]

(*b*) With the help of neat diagram explain the operation of Dual Slope ADC. [8]

11. (*a*) State advantages of active filter. Explain the operation of first order low pass filter with the help of circuit diagram. [8]

(*b*) Write short notes on : [8]

(*i*) Frequency synthesizer using PLL

(*ii*) FM demodulator using PLL.

Or

12. (*a*) Write short notes on : [8]

(*i*) Op-amp based audio amplifier circuit

(*ii*) Active tone control circuit.

(*b*) With the help of neat block diagram explain operation of PLL. Define the terms Lock range and Capture range. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-147

S.E. (E&TC and Electronics) (Second Semester)

EXAMINATION, 2015

ELECTROMAGNETICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—**(*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data wherever necessary.

SECTION I

1. (*a*) Derive an expression for electric field intensity $\overline{E}$ at any point produced by an infinitely long uniform line charge density ρ_LC/m. [9]

P.T.O.

(*b*) Given :

$$D = 4xyz^3 \bar{a}_x + x^2 z^2 \bar{a}_y + 6x^2 yz \bar{a}_z \text{ C/m}^3$$

in free space.

Find :

(*i*) total electric flux crossing the surface :

$$0 \leq x \leq 2,\ y = 2,\ 0 \leq z \leq 2$$

in the $\bar{a}_y$ direction. [9]

(*ii*) $\bar{E}$ at P(1, 2, 3).

Or

2. (*a*) What is divergence ? State the properties of divergence. State and explain the Divergence theorem. [9]

(*b*) Volume charge density is given as :

$$\rho_v = 10^{-5} e^{-100r} \sin \theta \text{ C/m}^2 \text{ for } 0 \leq r \leq 1 \text{ cm}$$

and for $r > 1$ cm. Estimate :

$$\bar{E} \text{ at } r = 1 \text{ m},\ \theta = 90°,\ \Phi = 180°$$

by thinking in terms of a point charge. [9]

3. (*a*) Derive an expression for energy stored in electrostatic field and hence derive expression for energy density : [8]

$$\frac{dw_E}{dv} = \frac{1}{2} \bar{D} . \bar{E}$$

(*b*) An electric potential is given by : [8]

$$V = 2x^2y + 20z - \frac{4}{x^2 + y^2} \text{ V}$$

Find $\overline{E}, \overline{D}$ and ρ_v at P(6, –2.5, 3).

Or

4. (*a*) Starting from Laplace equation derive an expression for the capacitance between conducting concentric cylinders having radii a and b with $a < b$. The permittivity of the dielectric is ε. [8]

(*b*) State and prove Laplace's and Poisson's equations. What is the significance of Poisson's equation ? [8]

5. (*a*) State and prove Ampere's circuital law in integral and differential form. [8]

(*b*) Let :

$$H = 6xy\ \overline{a}_x - 3y^2\ \overline{a}_y \text{ A/m}$$

in the $z = 0$ plane. Find the total current passing through the area bounded by :

$$0 \le x \le 5 \quad \text{and} \quad 0 \le y \le 5$$

in the a_z direction. [8]

Or

6. (*a*) Explain the scalar and vector magnetic potential. [8]

(*b*) Find the magnetic flux density at the center 'O' of a square of sides equal to 5 m and carrying 10 amperes of current. [8]

SECTION II

7. (*a*) Derive expression for dielectric-dielectric boundary conditions for electrostatic field. [9]

(*b*) The XY plane serves as the interface between two different media. Medium 1($z < 0$) is filled with a material whose $\mu_r = 6$ and medium 2($z > 0$) is filled with a material whose $\mu_r = 4$. If interface carries a current :

$$(1/\mu_0) \ \bar{a}_y \ \text{mA/m}$$

and

$$B_2 = 5\bar{a}_x + 8\bar{a}_z \ \text{m} \ \text{Wb/m}^2.$$

Find $\bar{H}_1$, $\bar{B}_1$. [9]

Or

8. (*a*) Derive an expression for boundary condition between two magnetic media. [9]

(*b*) A boundary exist at $z = 0$ between two dielectric :

$$\varepsilon_{r1} = 2.5 \text{ in the region } z < 0 \text{ and } \varepsilon_{r2} = 4$$

in the region $z > 0$. The field in the region 1 is the : [9]

$$\overline{E} = -30\,\overline{a}_x + 50\overline{a}_y + 70\,\overline{a}_z \text{ V/m}$$

Find :

(1) $\overline{D}_2$

(2) Angle α_1 between $\overline{E}_1$ and normal surface.

(3) Angle α_2 between $\overline{D}_2$ and normal to surface.

9. (*a*) What is Poynting vector ? What is significance of it ? Derive the expression for Poynting vector. [8]

(*b*) In the charge free region the magnetic field intensity is given by :

$$\overline{H} = H_m \cos(\beta z \omega' t)\,\overline{a}_y$$

by using Maxwell's equation. Calculate electric field intensity. [8]

Or

10. (*a*) State and derive Maxwell's equations in point and integral form for time varying field. [8]

(*b*) In a non-magnetic material :

$$(\varepsilon_r \neq 0,\ \mu = \mu_0,\ \sigma = 0)$$

(*i*) Find E using Maxwell equations

(*ii*) Find Poynting vector

(*iii*) Find time average power crossing the surface :

$$x = 1,\ 0 < y < 2,\ 0 < z < 3$$

given :

$$\overline{H} = 30 \cos (2\pi * 10^8\ t - 6x)\ \overline{a}_y \text{ mA/m}$$ [8]

11. (*a*) Explain in detail the steps of the moment methods. What are the applications of this method ? [8]

(*b*) Explain procedure to draw electric field lines by electrical method. [8]

Or

12. (*a*) What are different steps in graphical representation of electric field lines and the equipotential lines ? [8]

(*b*) What are the different steps of finite element analysis of any problem ? [8]

Total No. of Questions—**6**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-148

S.E. (Electronics/E & TC) (Second Semester)

EXAMINATION, 2015

ELECTROMAGNETIC

(2008 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Your answer will be valued as a whole.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data if necessary.

1. (*a*) Define electric flux density $(\overline{D})$. State and prove the differential form of Gauss' law. [8]

(*b*) A pair of 200 mm long concentric cylindrical conductors of radii 50 and 100 mm is filled with a dielectric of $\in = 10 \in_0$. A voltage is applied between the conductors to establish an electric field :

$$\overline{E} = \left(\frac{10}{r}\right)^6 \hat{a}_r \text{ V/m}$$

between the cylinders. Calculate the energy stored. [8]

P.T.O.

Or

2. (*a*) Using Laplace's equation derive expression for capacitance of co-axial cable which is located along 'Z' axis with conductor radius '*a*' and outer conductor of radius '*b*'. Assume V = V_0 at $r = a$ and V = 0 at $r = b$. [8]

(*b*) Uniform line charge of 120 nc/m lie along the entire extent of the three co-ordinate axes. Assuming free space conditions find $\overline{E}$ at P(–3, 2, –1). [8]

3. (*a*) Obtain expression for $\overline{H}$ at the center of circular conductor carrying current I using Biot-Savart's law. [8]

(*b*) A dielectric free space interface has the equation :

$$3x + 2y + z = 12 \text{ m}$$

The origin side of interface has :

$$\in_{r1} = 3 \text{ and } \overline{E}_1 = 2\hat{a}_x + 5\hat{a}_z \text{ V/m}$$

Find $\overline{E}_2$. [8]

Or

4. (*a*) Derive boundary conditions for the electric field at the interface between conductor and free space. [8]

(*b*) Verify Stokes' theorem for the field : [8]

$$\overline{H} = 6xy\ \hat{a}_x - 3y^2\ \hat{a}_y$$

and rectangular path around the region :

$$2 \leq x \leq 5 \quad -1 \leq y \leq 1,\ z = 0\ .$$

Let the positive direction of ds be $\hat{a}_z$.

5. (*a*) State and prove Poynting's theorem. Interpret each term.[8]

(*b*) Consider the potential system shown in Fig. 1. Set the initial values at the free nodes equal to zero. Calculate the potential at the free nodes for four iterations : [10]

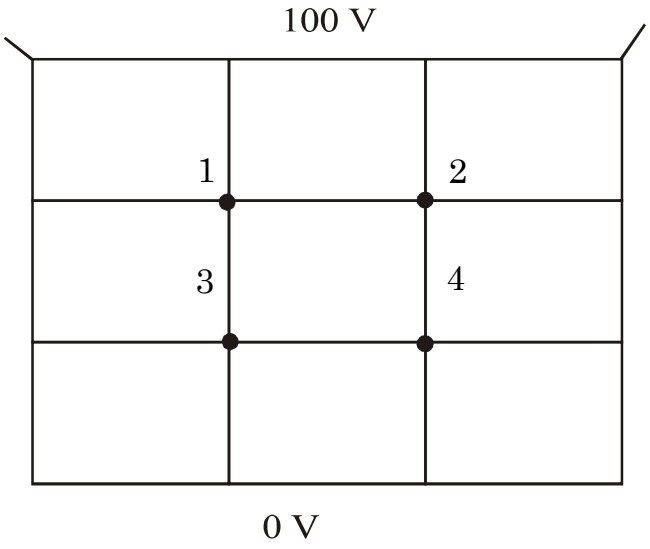


Fig. 1

Or

6. (*a*) Write short notes on (any *two*) : [10]

(*i*) Methods of images

(*ii*) Methods of moments

(*iii*) Finite element method.

(*b*) An $\overline{E}$ field in free space is : [8]

$$\overline{E} = 800 \cos (10^8 t - \beta y) \hat{a}_z \text{ V/m}$$

Find :

(*i*) β

(*ii*) λ

(*iii*) $\overline{H}$ at P(0.1, 1.5, 0.4)

at t = 8 ns.

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-149

S.E. (E & TC) (Second Semester) EXAMINATION, 2015

DATA STRUCTURES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of non-programmable electronic pocket calculator is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) List the different phases of creating a program. Explain any *two*. [4]

(*b*) Write an algorithm to sort the following data using bubble sort and insertion sort. Give time complexity for the bubble sort and insertion sort. [6]

42 37 4 22 17

P.T.O.

(*c*) What will be the output of the following code ? Justify your answer : [6]

```
for(i=o;i<4;i++)
{
        for(j=0;j<4;j++)
        {
                a[i][j]=20*(i+j);
                printf("%d\t",a[i][j]);
        }
printf("\n");
}
printf('%d%d",i,j);
```

Or

2. (*a*) Write a function in 'C' to implement selection sort. [4]

(*b*) What will be the output of the following code ? Justify your answer : [6]

```
void Fun(intx, int * p)
{
        x=x + 20;
        *p= * p+x;
}
void main()
{
int a=20,b=30;
        Fun(a, &b);
printf("%d%d",a,b);
}
```

(*c*) Define Recursive Function in 'C' and explain with example in detail. [6]

3. (*a*) Explain parameter passing to functions for swapping of two variables : [8]

(*i*) By value

(*ii*) By reference.

(*b*) Differentiate between static and dynamic memory allocation. List the functions used for dynamic memory allocation. [4]

(*c*) What is a string ? How do you declare a string variable in C ? Write and explain the function in C to find length of a string. [4]

Or

4. (*a*) Write a function "Add_poly" in 'C' for addition of two polynomials. [8]

(*b*) What are union ? Explain its advantages. Define a union having one integer, one float and an array of characters of size 2. [4]

(*c*) Write a short note on pointer to array and array of pointers. [4]

5. (*a*) Define GLL with node declaration and represent the following polynomial using GLL : [8]

$$20X^2Y^2Z + 10XY^2Z^2 + 8XYZ + 7XYZ^2.$$

(*b*) Write a C function to delete node in a linked list. [6]

(*c*) Explain node structure of a Doubly linked list and explain its advantages. [4]

Or

6. (*a*) Write a C function for the following operations in DLL : [8]

(*i*) Display the complete list

(*ii*) Search an element in the list.

(*b*) Write functions in C to create a node and display all nodes in SLL. [6]

(*c*) Define Circular linked list and compare with SLL. [4]

SECTION II

7. (*a*) Write a program for stack using array. [6]

(*b*) Explain the examples in general and applications of queue in computer science. [6]

(*c*) Convert the following expression to postfix from using stack. Show content of stack step by step. [6]

A + (B * C) ^ D.

Or

8. (*a*) Give algorithm for evaluation of postfix expression. [6]

(*b*) Write a program to create a queue using linked list. [6]

(*c*) What are types of expressions ? Explain with *one* example, how to convert infix expression to prefix and postfix form. [6]

9. (*a*) Construct the binary search tree from the following elements :

10, 8, 15, 12, 9, 6, 18.

Also show representation of this tree using array. [6]

(*b*) What are advantages of threaded binary trees ? [4]

(*c*) Describe the algorithm for non-recursive in order traversal in BST. [6]

Or

10. (*a*) Construct the expression tree for : [8]

B – C ^ D * E + 20.

(*b*) Explain the cases related to delete an element from binary search tree. [8]

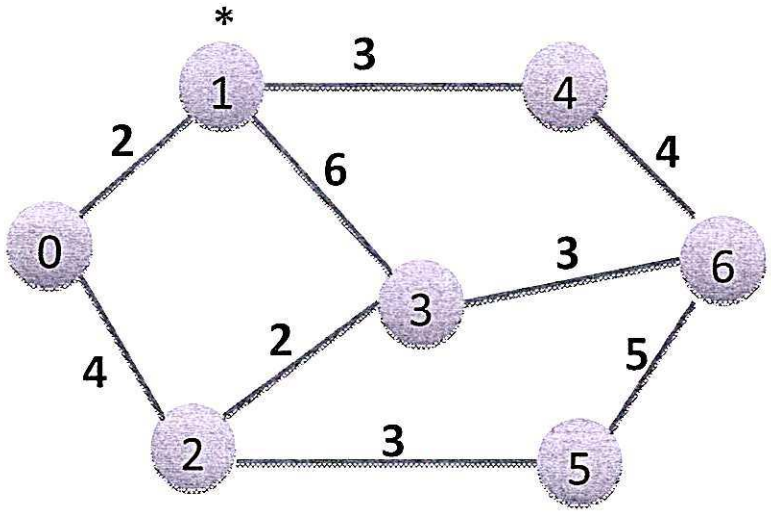
11. (*a*) How to represent a graph ? Represent the graph consisting of minimum 6 nodes. [4]

(*b*) Explain, how stack can be used for non-recursive depth first traversal related to graph traversal ? [6]

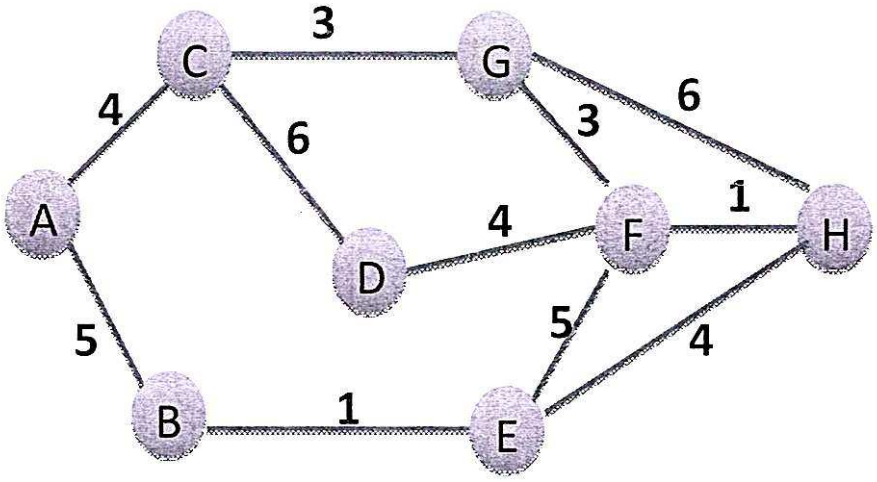
(*c*) Describe Kruskal's algorithm to find minimum spanning tree from graph. Consider graph mentioned in Q.12 (*b*). [6]

Or

12. (*a*) Find the minimum cost spanning tree from the following graph using Prim's algorithm. [8]



(*b*) Find shortest path from node A to all nodes in the following graph using Dijkstra's algorithm. [8]



Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-150

S.E. (E & TC/Elex.) (Second Semester) EXAMINATION, 2015

COMMUNICATION THEORY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw only waveform of DSBFC and its spectrum. [4]

(*b*) In typical AM transmission the voice frequency range is 300 Hz to 3000 Hz. Carrier signal used is of 3 MHz. Draw the frequency spectrum for the same. Also calculate the BW for the same. [8]

(*c*) Describe the use of VSB in television. [6]

P.T.O.

Or

2. (*a*) Explain any scheme to generate DSB-SC and its spectrum. [6]

(*b*) An audio signal 20 sin 2 π * 500 *t* is used to amplitude modulate a carrier of 80 sin 2 π * 10 *t*. Determine : [8]

(*i*) Modulation index

(*ii*) Sideband frequencies

(*iii*) Amplitude of each sideband frequency

(*iv*) Bandwidth required

(*v*) Total power delivered into a load of 600 Ω and

(*vi*) Power saved if one of the sideband is suppressed.

(*c*) Explain AM broadcast technical standard. [4]

3. (*a*) In FM system, the modulating frequency F_m = 1 kHz, the modulating voltage E_m = 2 volts and the deviation is 6 kHz. If the modulating voltage is raised to 4 volts, then what is the new deviation ? If the modulating voltage is further increased to 8 volts and modulating frequency is reduced to 500 Hz, what will be the deviation ? Calculate the modulation index in each case. Comment on the result. [8]

(*b*) "Phase and frequency modulation are inseparable." Justify the above statement with the help of block diagram and expression. [8]

Or

4. (*a*) A portable transmitter works on frequency modulator using an Armstrong method. If has a carrier frequency of 90 MHz and ΔF = 75 kHz. A NBFM generator with F_c = 200 kHz and ΔF = 25 kHz, is available. Draw only block diagram for such transmitter and indicate frequencies at different stages. [10]

(*b*) Difference between NBFM and WBFM. [6]

5. (*a*) A superheterodyne receiver tunes the range from 4 to 10 MHz with an IF of 1.8 MHz. Find the image frequency range for the receiver. Do any of the image frequency fall in the receiver pass band ? If the Rf circuits have a combined Q of 50, find the image frequency rejection ratio. [8]

(*b*) Define performance characteristics of radio receiver sensitivity, selectivity, fidelity, IFRR. [8]

Or

6. (*a*) In a superheterodyne receiver having no RF amplifier the loaded Q of the antenna coupling circuit (at the input of the mixer) is 90. If the intermediate frequency is 455 kHz, calculate the following : [8]

(*i*) Image frequency and image frequency rejection ratio at 950 kHz.

(*ii*) Image frequency and its rejection ratio at 10 MHz.

(*b*) Define and explain : [8]

(*i*) Mixers

(*ii*) Tracking error

(*iii*) De-emphasis

(*iv*) Coherent detection.

SECTION II

7. (*a*) Two resistors 10 kHz and 25 kHz are at room temperature (290°K) for a bandwidth of 150 kHz. Calculate thermal noise for each resistor, if two resistors are in series and if two resistors are in parallel. [8]

(*b*) Explain the following types of noise : [8]

(*i*) Johnson noise

(*ii*) Shot noise

(*iii*) Partition noise

(*iv*) White noise.

Or

8. (*a*) A receiver connected to an antenna whose resistance is 75 Ω has an equivalent noise resistance of 40 Ω. Calculate the receiver noise figure in dB and its equivalent noise temperature. [8]

(*b*) What is noise factor ? Derive friss formula. [8]

9. (*a*) Explain the performance of AM in presence of noise. [8]

(*b*) Describe threshold in angle modulation. [8]

Or

10. (*a*) Explain with suitable diagram importance of pre-emphasis and de-emphasis in the performance of FM system. [8]

(*b*) Compare performance of SSB receiver with that of the DSB SC receiver. [8]

11. (*a*) A television signal (video and audio) has a bandwidth of 4.5 MHz. This signal is sampled, quantized and binary coded to obtain a PCM signal : [8]

(*i*) Determine the sampling rate if the signal is to be sampled at a 50% rate above the Nyquist rate.

(*ii*) If the samples are quantized into 1024 levels, determine the number of binary pulses required to encode each sample.

(*iii*) Determine the binary pulse rate (bits per second) of the binary coded signal and the maximum bandwidth required to transmit the signal.

(*b*) State sampling theorem. Explain aliasing effect in detail with spectral diagram and compare sampling techniques. [10]

Or

12. (*a*) Describe companding with the help of μ law and A law. [8]

(*b*) Compare PCM and DM on the basis of : [6]

(*i*) Block diagram

(*ii*) Sampling rate and Bit rate.

(*c*) Describe band limited and time limited signal. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-151

S.E. (E&TC/Electronics) (I Sem.) EXAMINATION, 2015

SIGNALS AND SYSTEMS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Your answer will be valued as a whole.

(*vi*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vii*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Determine whether the following signals are periodic, if they are periodic, find the fundamental period : [8]

(*i*) $x(t) = \cos^2(2\pi t)$

(*ii*) $x[n] = (-1)^n$.

P.T.O.

(*b*) Sketch the even and odd components of the signals shown in Fig. 1 and Fig. 2. [4]

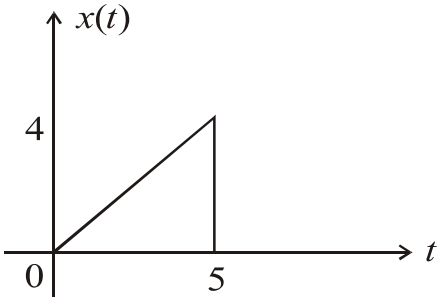


Fig. 1

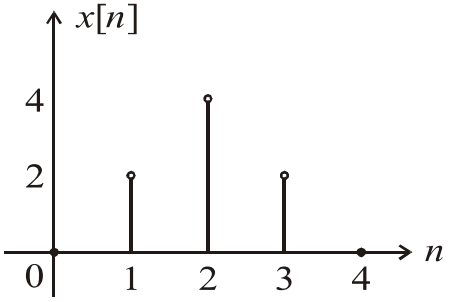


Fig. 2

(*c*) If $x[n] = [3, 2, 1, \underset{\uparrow}{0}, 1, 2, 3]$; $y[n] = [-1, -2, -3, \underset{\uparrow}{0}, 1, 2, 3]$, then sketch the following signals : [6]

(*i*) $x[3n - 1]$

(*ii*) $x[2n] + y[n - 4]$

(*iii*) $y[1 - n]$.

Or

2. (*a*) The systems that follow have input $x(t)$ or $x(n)$ and output $y(t)$ or $y(n)$. For each system determine whether it is : [10]

(I) Memoryless

(II) Stable

(III) Causal

(IV) Linear

(V) Time invariant.

(*i*) $y[n] = 2x(n) \cdot u(n)$

(*ii*) $y(t) = x(2 - t)$.

(*b*) Classify the following signals as energy, power signals and find corresponding value : [8]

(*i*) $x(t) = e^{-at}\ u(t),\ 0 < 0$

(*ii*) $x(t) = A\cos(\omega_0 t + \theta)$

(*iii*) $x(n) = -(0.5)^n\ u(n)$

(*iv*) $x(n) = 2e^{i\tau n}$.

3. (*a*) Impulse response of an LTI system is given by :

$$h(t) = \begin{cases} e^{-2t} & ; \quad t \geq 0 \\ 0 & ; \quad \text{otherwise} \end{cases}$$

Find the system output due to the input :

$$x(t) = \begin{cases} A & ; \quad 0 \leq t \leq 2 \\ 0 & ; \quad \text{otherwise} \end{cases}$$

Also sketch the output. [10]

(*b*) The impulse response of the relaxed LTI system is given as :

$$h(n) = a^n\ u(n) \text{ and } |a| < 1.$$

Determine the response of this system if it is excited by unit step sequence. [6]

Or

4. (*a*) Determine whether the following systems are stable, causal and static : [9]

(*i*) $h(t) = t \cdot e^{t}\ u(t)$

(*ii*) $h(t) = e^{-2t}\ u(-t)$

(*iii*) $h(t) = u(t + 1) - u(t - 3)$.

(*b*) State and prove properties of convolution and system interconnection. [7]

5. (*a*) Determine the Fourier series of the square wave shown in Fig. 3. [8]

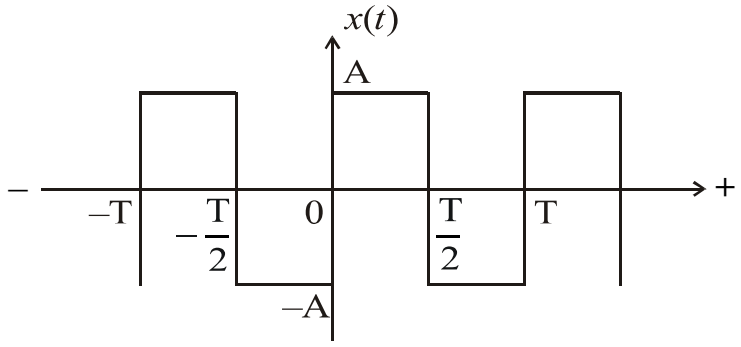


Fig. 3

(*b*) State and prove properties of Fourier transform : [8]

(*i*) Time Scaling

(*ii*) Time Shifting

(*iii*) Time differentiation

(*iv*) Conjugation.

Or

6. (*a*) Find the Fourier transform of the following : [10]

(*i*) Signum function

(*ii*) Unit step signal.

(*b*) (*i*) Write the equation for Trigonometric Fourier and Exponential series with their coefficients.

(*ii*) State the Dirichlet's conditions. [6]

SECTION II

7. (*a*) Determine the Laplace transform of the following signals : [10]

(*i*) $x(t) = u(t)$

(*ii*) $x(t) = u(t - 2)$

(*iii*) $x(t) = e^{-2t}\ u(t + 1)$

(*iv*) $x(t) = \sin(\omega,\ t)$

(*v*) $x(t) = e^{-3t}\ u(-t)$.

(*b*) Determine the initial value, X(0) and the final value X(∞) for the following signals using initial value and final value theorem : [8]

(*i*) $X(s) = \dfrac{1}{s(s-1)}$

(*ii*) $X(s) = \dfrac{s+1}{s^2 + 2s + 2}$.

Or

8. (*a*) Determine the Inverse Laplace transform of : [10]

$$X(s) = \frac{2}{s(s+1)(s+2)^2}.$$

(*b*) State and prove time scaling property of Laplace transform. [4]

(*c*) Determine the Laplace transform of the signals shown below : [4]

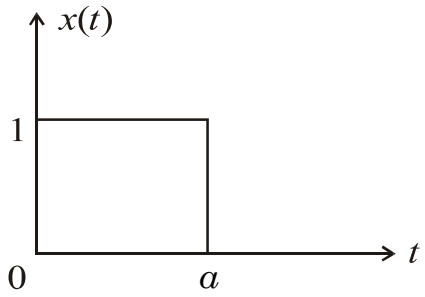


Fig. 4

9. (*a*) State and prove the relation between autocorrelation and ESD. [8]

(*b*) Find ESD of the $x(t) = e^{-4t}\ u(t)$. [8]

Or

10. (*a*) Find the autocorrelation of power signal $x(t) = K \cdot \sin \omega_c t$. [8]

(*b*) Find cross-correlation of the following signal : [8]

$$x(n) = \{\underset{\uparrow}{2}, 3, 4, 5\},\ y(n) = \{\underset{\uparrow}{3}, 2, 1, 4\}.$$

11. (*a*) Probability density function (p.d.f.) of a random variable X is given by : [8]

$$f(x) = \begin{cases} K\left(1 - x^2\right) & ; \quad 0 \le x \le 1 \\ 0 & ; \quad \text{otherwise} \end{cases}$$

then find :

(*i*) K

(*ii*) C.D.F.

(*iii*) P(0 ≤ X ≤ 2).

(*b*) Write the expression for C.D.F. and P.D.F. of a uniform variable and sketch the same and illustrate an example of uniform random variable. [8]

Or

12. (*a*) State and prove properties of P.D.F. [8]

(*b*) P.D.F. of a continuous random variable is given in Fig. 5. Find out the C.D.F. [8]

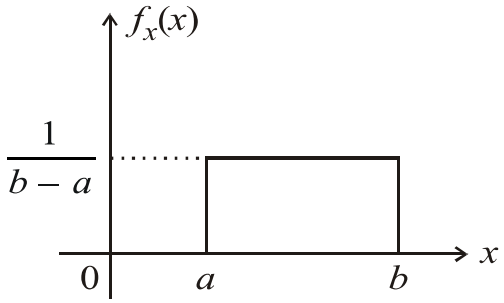


Fig. 5

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-152

S.E. (Electronics/E&TC) (II Sem.) EXAMINATION, 2015

SIGNALS AND SYSTEM

(2008 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Figures to the right indicate full marks.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Assume suitable data, if necessary.

(*v*) Use of calculator is allowed.

1. (*a*) Find even and odd components of the following signals : [4]

(*i*) $x(t) = 1 + t + 3t^2 + 5t^3 + 9t^4$

(*ii*) $x(t) = \cos(t) + \sin(t) + \sin(t)\cos(t)$.

(*b*) For each of the following signals, determine whether it is periodic, and if it is, find the fundamental period : [4]

(*i*) $x(t) = 8\sin(400\pi t)$

(*ii*) $x(t) = 5 + t^2$.

(*c*) Find $y(n)$, discrete time signal convolution integral. If, [4] $x(n) = [u(n) - u(n-4)]$ and $h(n) = \{2, 2, 2, 2\}$.

P.T.O.

Or

2. (*a*) For the following system, determine whether it is : [3]

(*i*) Memoryless

(*ii*) Stable

(*iii*) Causal

$$y(t) = x(3 - t).$$

(*b*) Compute the convolution integral by graphical method and sketch the output for the following signal : [6]

$$x(t) = u(t) - u(t - 2),\ h(t) = e^{-2t}\ u(t).$$

(*c*) Sketch the waveform of the following signal, [3]

$$y(t) = r(t + 1) - r(t) + r(t - 2).$$

3. (*a*) Find the Fourier transform of the following signals, [6]

(*i*) $x(t) = 2[u(t) - u(t - 4)]$

(*ii*) $x(t) = u(t)$.

(*b*) State and prove the following properties of the Laplace transform : [6]

(*i*) Time shifting

(*ii*) Initial value theorem

(*iii*) Final value theorem.

Or

4. (*a*) Show that rectangular function in time domain to become Sinc function in frequency domain. [6]

(*b*) Find the Laplace transform of the following signals using properties of Laplace transform : [6]

(*i*) $x(t) = u(t - 3)$

(*ii*) $x(t) = t^2 \ e - 3t \ u(t)$.

5. (*a*) Prove that for an energy signal $x(t)$ the Autocorrelation function and energy spectral density form Fourier Transform pair. [7]

(*b*) State and explain all the properties of energy spectral density [ESD]. [6]

Or

6. (*a*) State and explain all the properties of probability, CDF and PDF. [8]

(*b*) Determine the cross correlation between two sequences given below : [5]

$$x_1[n] = \{1, \ 2, \ 3, \ 4\}$$

$$x_2[n] = \{3, \ 2, \ 1, \ 0\}.$$

7. (*a*) Probability density function of a Random variable x is defined by : [7]

$$fx(x) = \begin{cases} K(1 - x^2), & 0 \leq x \leq 1 \\ 0 \quad , & \text{elsewhere} \end{cases}$$

Find :

(*i*) k

(*ii*) CDF

(*iii*) $P(0 \leq x \leq 2)$.

(*b*) Explain Gaussian probability model with respect to its density and distribution function. [6]

Or

8. (*a*) CDF of a certain Random variable is given by : [7]

$$F_x(x) = \begin{cases} 0 & x \leq 0 \\ Kx^2 & 0 < x \leq 10 \\ 100K & x > 10 \end{cases}$$

(*i*) Find the value of K.

(*ii*) Determine PDF.

(*iii*) Find the values of Probabilities $P(x \leq 5)$; $P(x > 11)$.

(*b*) A student arrives late for a class 30% of the times. Class meets 5 times a week. Then find : [6]

(*i*) Probability of student being late for at least three classes in a given week.

(*ii*) Probability of student being late for two classes in a given week.

(*iii*) Probability of student will not be late at all during a given week.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-162

S.E. (Instru. and Control) (First Semester) EXAMINATION, 2015

FUNDAMENTALS OF INSTRUMENTATION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What are the basic blocks of instrumentation system ? Explain in detail. [10]

(*b*) Explain Calibration and documentation in Calibration. [8]

P.T.O.

Or

2. (*a*) Define error. How are errors classified ? Discuss the remedies applied to minimize it. [10]

(*b*) Explain Traceability in Calibration. [8]

3. (*a*) Describe constructional details and principle of operation of PMMC instruments. [8]

(*b*) It is required to calibrate a PMMC voltmeter. Explain a setup using DC Potentiometer. [8]

Or

4. (*a*) Derive expression for extension of range of an ammeter. [8]

(*b*) Describe constructional details and principle of operation of Moving Iron instruments. [8]

5. (*a*) Differentiate between : [8]

(*i*) DC Bridge and AC Bridge

(*ii*) Deflection and Null type Bridge.

(*b*) Which bridge can be used for measurement of frequency. Draw the diagram and derive the equation. [8]

Or

6. (*a*) Explain limitations of Wheatstone Bridge. [8]

(*b*) Explain the working of Maxwell bridge with diagram and equations. [8]

SECTION II

7. (*a*) Write a short note on Digital Multimeter. [8]

(*b*) With help of neat block diagram explain the working of Digital Thermometer. [8]

Or

8. (*a*) Write a short note on Digital Phase meter. [8]

(*b*) Explain how distance can be measured digitally using Ultrasonic Distance meter. [8]

9. (*a*) Explain phase measurement using dual trace CRO in X-Y mode and in normal mode. [8]

(*b*) State any 5 controls on CRO front panel and their function. Explain in brief, how they are brought out. [10]

Or

10. (*a*) Draw the basic block diagram of CRO. Explain in detail the working of Delay Line. [8]

(*b*) List the advantages of Digital Storage Oscilloscope. [2]

(*c*) Explain how phase can be measured in Y-t and X-Y mode with diagrams using CRO. [8]

11. (*a*) Write a note on Virtual Instrumentation. [8]

(*b*) Write a note on X-Y recorder. [8]

Or

12. (*a*) Write a note on strip chart recorder. [8]

(*b*) Explain the block diagram of function generator in detail. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-163

S.E. (Instrumentation and Control) (First Semester)

EXAMINATION, 2015

LINEAR INTEGRATED CIRCUITS—I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) State and mention the significance of the ideal chracteristics of OP AMP. [8]

(*b*) Explain the following terms with respect to OP AMP : [10]

(*i*) Frequency response

(*ii*) UGB

(*iii*) Bias current

(*iv*) Offset current

(*v*) Voltage gain.

P.T.O.

Or

2. (*a*) Define input offset and output offset voltage for an OP AMP. With a suitable diagram, explain how output offset voltage can be nullified. [10]

(*b*) What is frequency response ? Define cut-off frequency and explain how bandwidth is calculated from the frequency response. [8]

3. (*a*) Compare inverting and non-inverting amplifier based on four differentiation points. [8]

(*b*) What is a voltage follower ? With the help of a neat labelled diagram, state its important characteristics. [8]

Or

4. (*a*) With a suitable diagram, prove that the gain of non-inverting amplifier using OP-AMP is given as $\left[1 + \left(\frac{R_F}{R_1}\right)\right]$. [8]

(*b*) What is feedback ? Define types of feedback. [4]

(*c*) Compare voltage series and voltage shunt type of feedback amplifiers based on two points. [4]

5. (*a*) Draw a neat labelled diagram of 3 OP-AMP Instrumentation Amplifier. Derive its gain equation. [8]

(*b*) Explain differentiator circuit using op-amp and draw its frequency response plot. [8]

Or

6. (*a*) Solve the given equation using suitable OP-AMP networks. Diagram is expected : [8]

$$V_{out} = 3V1 - V2 + 2V3.$$

(*b*) Draw neat labelled diagrams of ideal integrator and practical integrator using OP-AMP. Explain their working with the help of frequency response and equations. [8]

SECTION II

7. (*a*) Design a Schmitt Trigger for UTP = +2.3V and LTP = –2.3V. Assume OP-AMP to be IC741 and saturation voltages as +/–10V. Draw the neat labelled diagram. [10]

(*b*) State the Barkhausen criteria. Draw neat labelled diagram of Wein Bridge oscillator. State its frequency and gain equation. [8]

Or

8. (*a*) Draw neat labelled diagrams of and explain the working : [10]

(*i*) ZCD (Inverting and Non-inverting type) using OP-AMP

(*ii*) Comparator (Inverting and Non-inverting type) using OP-AMP.

(*b*) Explain the working of Schmitt Trigger with the help of a neat labelled diagram and waveforms. [8]

9. (*a*) What is IC555 ? Draw the pin diagram and internal block diagram of IC555. [8]

(*b*) Write note on IC 7805. [8]

Or

10. (*a*) With a neat labelled diagram explain how IC555 can be used as an Astable multivibrator with 50% duty cycle. [8]

(*b*) Write note on switching voltage regulator. [8]

11. (*a*) What is a filter ? State the *four* major points of differentiation between active and passive. [8]

(*b*) Draw the ideal and practical frequency response plots of four types of filters. [8]

Or

12. (*a*) Write short note on any *two* of the following : [8]

(*i*) Butterworth filter

(*ii*) Chebyshew filter

(*iii*) Bessel approximation.

(*b*) Design first order high pass filter with cut-off frequency of 1 kHz and pass band gain of 2. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-164

S.E. (Instru./Control) (I Sem.) EXAMINATION, 2015

PRINCIPLES OF SENSORS AND TRANSDUCERS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Solve Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Write Section I and Section II on separate answer sheet.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain dynamic characteristics of transducers in detail. [10]

(*b*) Define standards and give its classification in brief. [8]

P.T.O.

Or

2. (*a*) Define transducer. Give and explain its selection criteria. [10]

(*b*) Define error and explain different types of errors. [8]

3. (*a*) Explain temperature measurement with mercury thermometer with neat sketch. [8]

(*b*) What is load cell ? Discuss application of strain gauge in load cell in detail. [8]

Or

4. (*a*) List types of manometer and how manometer can be used for measurement of pressure with neat diagram. [8]

(*b*) Explain the principle and working of the torsion bar for the measurement of torque. [8]

5. (*a*) With neat sketch explain air bubbler system method used for density measurement. [8]

(*b*) Explain viscosity-to-pressure convertor in detail with neat sketch. [8]

Or

6. (*a*) Explain level-to-pressure convertor in detail with neat sketch. [8]

(*b*) Explain flow obstruction type elements used in flow measurement in detail. [8]

SECTION II

7. (*a*) Explain working principle of resistance temperature detector and also list different types of it with their temperature ranges. [8]

(*b*) Explain capacitive transducer for measurement of displacement. [8]

Or

8. (*a*) Draw and explain working of optical radiation thermometer. [8]

(*b*) Explain capacitive transducer for measurement of thickness. [8]

9. (*a*) Explain piezoelectric transducer. Give any *one* application of it. [8]

(*b*) Explain Ionization vacuum gauges in detail with diagram. [8]

Or

10. (*a*) Explain thermoelectric transducer. Give its classification details. [8]

(*b*) Explain digital tachometer in detail with diagram. [8]

11. (*a*) Write short notes on : [10]

(*i*) Self-balancing systems

(*ii*) Analog and digital readout systems.

(*b*) Explain magnetic tape recorders with diagram. [8]

Or

12. (*a*) Write short notes on : [10]

(*i*) Servo operated system

(*ii*) Data-loggers.

(*b*) Explain digital input-output devices. [8]

Total No. of Questions—**8**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-165

S.E. (Inst. & Control. Engg.) (First Semester) EXAMINATION, 2015

AUTOMATIC CONTROL SYSTEMS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer book.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain open loop and closed loop control system with suitable example. [4]

(*b*) Compare the following control systems :

(*i*) Time-variant and Time-invariant control systems

(*ii*) Causal and non-causal control systems

(*iii*) Stable and unstable control systems. [6]

P.T.O.

(*c*) Obtain equivalent electrical circuits for given mechanical systems in Fig. 1, using Force to voltage analogy. Also draw circuit diagrams of results obtained. [8]

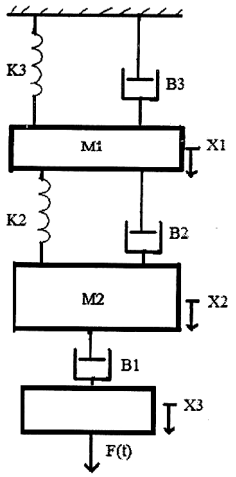


Fig. 1.

2. (*a*) Define transfer function of control system. Derive the transfer function for canonical form of control system. Write merits and demertis of transfer function. [8]

(*b*) State Masson's gain formula. Find the transfer function of the control system given by its signal flow graph in Fig. 2. [8]

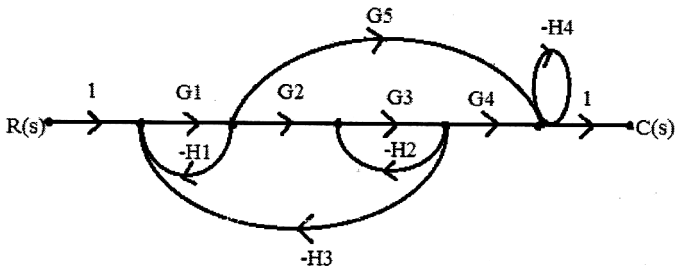


Fig. 2

3. (*a*) Derive the expression for response of second order control system if unit step signal is applied. Draw graph for the same. Also mention all the terms on the graph. [8]

(*b*) Measurement conducted on servomechanism system shows the system response to be $c(t) = 1 + 0.2\ e^{-60t} - 1.2\ e^{-10t}$ when subjected to a unit step input. (*i*) Obtain the expression for the closed loop transfer function (*ii*) Determine the undamped natural frequency of oscillations and damping ratio of the system. [8]

4. (*a*) Compare block diagram representation technique with signal flow graph technique. [4]

(*b*) Define :

(*i*) Order

(*ii*) Type

(*iii*) Pole

(*iv*) Zero

(*v*) Characteristics equation

(*vi*) Time constant. [6]

(*c*) Define :

(*i*) Maximum overshoot

(*ii*) Rise time

(*iii*) Settling time

(*iv*) Steady state error. [8]

SECTION II

5. (*a*) The open loop transfer function of unity feedback system if $G(s) = \frac{K}{s(1 + 0.4s)(1 + 0.25s)}$. Find the range of K such that closed loop system is absolutely stable. Use Routh's method. [6]

(*b*) Draw root locus of the control system with

$$G(s)H(s) = \frac{K}{s(s + 4)(s^2 + 4s + 20)}.$$

Mark all the salient points on the locus. [12]

6. (*a*) Write correlation between time domain and frequency domain specifications. [6]

(*b*) For the system having open loop transfer function

$$G(s)H(s) = \frac{1000}{s(1 + 0.1s)(1 + 0.01s)}.$$

Determine stability of the given system using Bode plot. [10]

7. (*a*) Define polar plot. Find the polar plot of unity feedback system with a pole at origin i.e. $G(s) = \frac{1}{(1 + s)}$. [8]

(*b*) Define :

(*i*) State

(*ii*) State variables

(*iii*) State space

(*iv*) State equations. [8]

8. (*a*) Define :

(*i*) Bandwidth

(*ii*) Resonant frequency

(*iii*) Phase margin

(*iv*) Gain margin

(*v*) Gain crossover frequency

(*vi*) Phase crossover frequency. [12]

(*b*) Write short note on :

Mapping theorem and Principle of Argument. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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[4757]-166

S.E. (Instrumentation & Control) (II Sem.) EXAMINATION, 2015

DIGITAL TECHNIQUES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Convert the following : [8]

(*i*) $(5A2)_H$ to Octal

(*ii*) $(1510)_{10}$ to its Hex equivalent

(*iii*) $(1010)_2$ to Gray code

(*iv*) Convert $(1001)_2$ to Excess-3 code.

(*b*) Find the minimal expression for the following function by using a Quine McCluskey method : [8]

$f(A, B, C, D) = \Sigma m(0, 1, 4, 6, 8, 9, 10, 12) + d(5, 7, 14)$.

P.T.O.

Or

2. (*a*) (*i*) Perform $(-6)_{10} - (-2)_{10}$ using 2's Complement Method. [2]

(*ii*) Add $(569)_{10}$ and $(687)_{10}$ in BCD. [2]

(*iii*) Convert $(1001)_{BCD}$ to Excess-3. [4]

(*b*) (*i*) Express the binary number $(1001.001)_2$ in power of 2. [2]

(*ii*) Write a short note on Gray Code. [2]

(*iii*) Convert $Y = AB + A\overline{C} + BC$ in canonical SOP form. [4]

3. (*a*) Reduce the Boolean expression : [6]

(*i*) $Y = AC + \overline{A}BC$

(*ii*) $Y = AB + (A + B)(\overline{A} + B)$

(*iii*) $Y = \overline{A}\overline{B}\overline{C} + \overline{A}B\overline{C} + \overline{A}BC + A\overline{B}C$.

(*b*) Reduce the following function using K-map technique : [12]

(*i*) $Y = f(A, B, C) = \overline{A}\overline{B}\overline{C} + \overline{A}B + AB\overline{C} + AC$

(*ii*) $Y = f(A, B, C) = \overline{A}\overline{B} + B\overline{C} + BC + A\overline{B}\overline{C}$.

Or

4. (*a*) (*i*) Convert JK flip-flop to SR flip-flop. [6]

(*ii*) Write a short note on Race Around Condition of JK flip-flop. [6]

(*b*) Write a short note on Flash Memory. [6]

5. (*a*) Design 3-bit binary up/down Ripple counter. Draw Timing diagram. [10]

(*b*) Design MOD-7 counter using IC7490. [6]

Or

6. (*a*) (*i*) Write a short note on frequency division taking place in Asynchronous Counter. [6]

(*ii*) Design Mod-128 counter using ICs 7493. [4]

(*b*) Compare asynchronous counter and Synchronous Counter. [6]

SECTION II

7. (*a*) Design the following function using 16.1 Multiplexer : [8]

$f(A, B, C, D, E) = \Sigma m(2, 4, 5, 7, 10, 14, 15, 16, 17, 25, 26, 30, 31)$.

(*b*) Compare Mux and Demux with respect to the following points : [8]

(1) Type of logic circuit

(2) Number of data input

(3) Number of data output

(4) Number of select input

(5) Number of data output

(6) Relation between Input-output Line and Select Line

(7) Operation Principle

(8) Application.

Or

8. (*a*) Design Hexadecimal to Binary Encoder. [8]

(*b*) Design BCD to seven segment decoder for a common cathode display. [8]

9. (*a*) Explain CMOS-NOR Gate with neat sketch. [8]

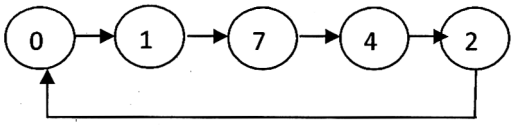
(*b*) List and explain important characteristics of N-channel MOSFET. [8]

Or

10. (*a*) Explain current sourcing and Sinking action in TTL with neat sketch. [8]

(*b*) Explain Interfacing of CMOS with ECL. [8]

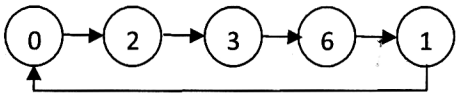
11. (*a*) Design a sequence generator using T flip-flop for the following sequence : [10]



(*b*) Explain sequence generator with neat sketch. [8]

Or

12. (*a*) Design non-sequential counter using JK flip-flop. [10]



(*b*) Explain Digital Clock with a neat sketch. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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[4757]-167

S.E. (Instrumentation & Control) (Second Semester)

EXAMINATION, 2015

APPLIED ELECTRONICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Your answers will be valued as a whole.

(*vi*) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vii*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Develop a system where input signals are coming from different transducers like thermocouple (output is mV), Resistive Pressure transducer (output is change in resistance), PH sensor (output is current), electronic level sensor (Output is current),

P.T.O.

Encoder (Output is pulses), and Sound sensor (output is audio signal) are applied to inputs of multiplexer IC CD4051 simultaneously. How will be circuit work ? Explain it by suitable diagram. [10]

(*b*) How to connect continuous analog signals to the ADC ? Explain it using sample and hold circuit. [8]

Or

2. (*a*) Design 3-bit flash type ADC, when analog input is changes from 0 to 5 volts and Vref is 5 volts. Draw necessary observation table with diagrams. [10]

(*b*) Explain the following performance characteristics of ADC :

(*i*) Linearity

(*ii*) Resolution

(*iii*) Quantization Error

(*iv*) DNL or INL Error. [8]

3. (*a*) Derive output equation for 4-bit binary weighted register type DAC with neat circuit diagram. [8]

(*b*) What is PWM type DAC ? Explain it with suitable diagrams. [8]

Or

4. (*a*) Using Thevenin's theorem, derive output voltage equation for 4-bit, R-2R type DAC. [8]

(*b*) Explain the following performance characteristics of DAC :

(*i*) Resolution

(*ii*) Accuracy

(*iii*) Full-Scale Range (FSR)

(*iv*) Monotonacity. [8]

5. (*a*) Is SCR is voltage controlled or current controlled device ? Justify with suitable diagrams. [8]

(*b*) Is MOSFET is voltage or current controlled device ? Justify *correct* answer with neat diagrams. [8]

Or

6. (*a*) Is TRIAC is better than SCR ? Justify *correct* answer with neat diagrams. [8]

(*b*) Draw and explain the symbol and characteristics of IGBT. [8]

SECTION II

7. (*a*) List out primary and secondary types of batteries. Explain the concept battery monitoring system with neat diagram. [10]

(*b*) What are Taper, Pulsed, Trickle and Float charging methods ? Explain in detail. [8]

Or

8. (*a*) How the IC L-200 is used as a adjustable voltage and current regulator charger ? Explain with neat diagrams. [10]

(*b*) What is memory effect and capacity of battery ? Explain. [8]

9. (*a*) A temperature transducer gives output in the range of 1 V to 5 V. Design suitable circuit that gives output in the range of 4 to 20 mA. [8]

(*b*) Why VCO needs a constant current source ? Explain VCO with neat block diagram. [8]

Or

10. (*a*) Derive output current equation of grounded load type V to I convertor. [8]

(*b*) Explain the frequency to voltage conversion technique with neat block diagram. [8]

11. (*a*) In data transmission and telemetry, how amplitude modulation is useful ? Explain. [8]

(*b*) Explain FDM technique using neat block diagram. [8]

Or

12. (*a*) How ASK is useful in wireless telegraphy ? Explain with neat diagram coherent and non-coherent detector. [8]

(*b*) Explain TDM technique using neat block diagram. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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[4757]-168

S.E. (Instrumentation and Control) (Second Semester)

EXAMINATION, 2015

TRANSDUCERS AND SIGNAL CONDITIONING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) *All* questions are compulsory.

(*iii*) Draw sketches wherever necessary.

(*iv*) Use of logarithmic tables and pocket calculator is permitted.

(*v*) Figures to the right indicate full marks.

SECTION I

1. (*a*) List different blocks of signal conditioning system and explain any *two*. [6]

(*b*) Enlist the different methods of measure resistance. Justify "Wheatstone bridge is preferred for resistive sensors at a first stage signal conditioning circuit. [6]

(*c*) Explain optical pyrometer with a neat diagram. [6]

P.T.O.

Or

2. (*a*) Discuss with neat diagram how LM 35 can be used in thermocouple signal conditioning circuit for cold junction compensation. [8]

(*b*) Temperature of plating operation must be measured for control temperature within the range of 500°C to 600°C. Develop a measuring system with J type thermocouple that scales that temperature into 0 to 5 V. Assume ref. Junction temperature is 0°C. [10]

At T_1 = 500°C V_{THz} = 27.39 mV

T_2 = 600°C V_{THz} = 33.11 mV

3. (*a*) If resistance of strain gauge is 350 Ω and if there is 5% change in resistance by application of force, prove that sensitivity increases if we use half and full bridge configuration over quarter bridge configuration. [10]

(*b*) Explain semiconductor strain gauge with working principle, material, application. [6]

Or

4. (*a*) Explain piezoelectric sensor with neat diagram working principle, material and necessity of charge amplifier. [8]

(*b*) Discuss different source of error in strain gauge. How can they be eliminated ? [8]

5. (*a*) Explain working and signal conditioning of capacitive proximity switch. [8]

(*b*) Explain optical encoder with neat diagram and signal conditioning circuit. [8]

Or

6. (*a*) Explain signal conditioning of LVDT in respect to phase modulation, phase detection. [8]

(*b*) Explain working of optical tachometer with necessary signal conditioning circuit. [8]

SECTION II

7. (*a*) What do you mean by electromechanical transducers ? Explain how these can be used to measure level along with construction, working and signal conditioning scheme. [9]

(*b*) Explain the signal conditioning blocks involved in ultrasonic level sensor. [9]

Or

8. (*a*) Explain how capacity transducers are exciated and O/P of sensor is conditioned. [9]

(*b*) Explain nuclear gauge for level measurement along with a neat diagram. [9]

9. (*a*) Explain electromagnetic flowmeter. [8]

(*b*) Explain working DP cell. [8]

Or

10. (*a*) Explain turbine flowmeter and suggest suitable signal conditioning scheme for the same. [8]

(*b*) Explain the working of mass flow meter along with neat diagram, construction and working. [8]

11. (*a*) Explain conductivity meter. [8]

(*b*) Explain pH meter. [8]

Or

12. (*a*) Explain any *one* vibration pickup. [8]

(*b*) Explain microphone (any *one*). [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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[4757]-169

S.E. (Instru. & Control)(Second Semester) EXAMINATION, 2015

PHOTONICS AND INSTRUMENTATION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) State and prove Snell's law. [4]

(*b*) Explain the following : [12]

(*i*) Nature of light

(*ii*) Electromagnetic spectrum

(*iii*) Propagation of Light.

P.T.O.

Or

2. (*a*) Explain the following terms : [12]

(*i*) Reflection and its Laws

(*ii*) Refraction and its Laws.

(*b*) Refractive index of plasma tube is 1.4. Calculate the Brewster's angle to get dominant laser beam. [4]

3. (*a*) Describe natural sources of light. [4]

(*b*) With neat diagram explain any *one* gas discharge lamp. [12]

Or

4. (*a*) With neat diagram explain the construction and working of incandescent lamp. [10]

(*b*) What is Radiometry and Photometry ? Give different Radiometric units and their equivalents related to point light source. [6]

5. (*a*) Explain the following terms for LED : [12]

(*i*) Electroluminescent process

(*ii*) Characteristics

(*iii*) Choice of Material.

(*b*) With neat diagram explain semiconductor laser. [6]

Or

6. (*a*) Explain basic steps to generate LASER beam. State properties of LASER. State advantages and disadvantages. [10]

(*b*) Explain working of light emitting diode. Explain any *one* type of structures of LED. [8]

SECTION II

7. (*a*) Explain any *two* types of thermal detector with suitable diagram. [8]

(*b*) Explain with diagram photomultiplier tube. [8]

Or

8. (*a*) Explain any *two* types of Quantum detector with suitable diagram. [8]

(*b*) Explain in short : [8]

(*i*) Phototransistor

(*ii*) CCD.

9. (*a*) Explain the diffraction grating equation with its application. Suggest experimental set up to determine the unknown wavelength. [12]

(*b*) What is the role of grating in optics ? Explain in detail. [4]

Or

10. (*a*) Differentiate Absorption filter and Interference filter. [4]

(*b*) Write short notes on (any *three*) : [3×4]

(*i*) Beam Splitter

(*ii*) Prism

(*iii*) Filters

(*iv*) Lenses.

11. Explain working principle of the following with suitable diagram : [2×9]

(*a*) Astronomical Telescope

(*b*) Abbe's Refractrometer.

Or

12. (*a*) Draw the neat diagram of monochromator and explain functions of various components of monochromator. Which components contribute to the resolution of monochromator ? [9]

(*b*) Explain with neat diagram optical projection system. [9]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

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S.E. (Instrumentation & Control) (II Sem.) EXAMINATION, 2015

DRIVES AND CONTROL

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Solve Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Describe the basic principle of Generator. Explain the classification of d.c. Generators in detail with circuit diagrams. [8]

(*b*) Explain the losses in d.c. Generator. [8]

P.T.O.

Or

2. (*a*) Write the necessity of the starter in d.c. motors. Explain the three-point starter in detail in shunt motor. [8]

(*b*) Explain the conventional methods for speed control d.c. shunt motors. [8]

3. (*a*) Write the difference between squirrel-cage rotor and phase-wound rotor in induction motor in detail. Which type is mostly used in industries and why ? [8]

(*b*) Explain the working and construction of alternator. [8]

Or

4. (*a*) Write the working principle of induction motor. Why does rotor rotate in it ? [8]

(*b*) Derive the expression for maximum torque generation in 3-phase induction motor. [8]

5. Write short notes on (any *two*) : [18]

(*a*) Variable reluctance stepper motor

(*b*) Universal motor

(*c*) Half stepping and full stepping in stepper motors.

Or

6. (*a*) Write the working principle of stepper motors. Mention the *two* applications of it. [9]

(*b*) Explain the Universal motors. Write the speed control methods for it. [9]

SECTION II

7. (*a*) Describe the following terms as applicable to SCR : [8]

(*i*) Latching

(*ii*) Holding current

(*iii*) Reverse Breakover voltage

(*iv*) dv/dt rating.

(*b*) Explain in detail the construction of SCR and also the necessity of gate triggering in SCR. [8]

Or

8. (*a*) Write the construction, working and characteristics of UJT. [8]

(*b*) With neat diagrams, explain the Class C and Class D communication circuits for SCRs. [8]

9. (*a*) Explain the working principle of half wave controlled rectifier with waveforms. [9]

(*b*) What are choppers ? Explain the methods of classification of choppers. [9]

Or

10. (*a*) Give the classification of inverters. Explain any *one* in detail. [9]

(*b*) With neat diagrams and waveforms, explain the working of three-phase half-wave controlled rectifier with resistive load. [9]

11. Write short notes on (any *two*) : [16]

(*a*) Braking of induction motor

(*b*) Three-phase SCR drive in d.c. motor control

(*c*) Dynamic breaking of separately excited d.c. motor.

Or

12. (*a*) With a neat block diagram, explain the chopper controlled d.c. motor. [8]

(*b*) Give the methods by which speed of the induction motors can be varied. Explain any *one* in detail. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4757]-171

S.E. (Chemical/Printing/Poly/Petroleum/Petro-chemical)

(I Sem.) EXAMINATION, 2015

ENGINEERING MATHEMATICS—III

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of electronic pocket calculator is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Solve any *three* : [12]

(*i*) $\left(D^3 + 1\right)y = \cos\left(2x + 3\right)$

P.T.O.

(*ii*) $\frac{d^2y}{dx^2} - 4y = \cosh(2x - 1)$

(*iii*) $\frac{d^2y}{dx^2} + 9y = x^2 + 3^x$

(*iv*) $y'' - 2y' + y = e^x \ln x$ by the method of variation parameters.

(*b*) Solve : [5]

$$\frac{dx}{x^2 + y^2} = \frac{dy}{2xy} = \frac{dz}{(x + y)^3 z}.$$

Or

2. (*a*) Solve any *three* : [12]

(*i*) $(D^2 - 2D + 3)y = \cos x$

(*ii*) $x^2 \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} - 4y = x^4$

(*iii*) $(D^2 - 2D)y = e^x \sin x$ by method of variation of parameters

(*iv*) $(x + 1)^2 \frac{d^2y}{dx^2} + (x + 1)\frac{dy}{dx} + y = 2\sin(\ln(x + 1))$

(*v*) $(D^2 - 1)y = \cosh x \sinh x.$

(*b*) A mechanical system with two degrees of freedom satisfies :

$$2\frac{dx}{dt} + 3y = 4; \quad 2\frac{dy}{dt} - 3x = 0.$$

Obtain expression for x and y in terms of t. [5]

3. (*a*) Solve the heat equation : [8]

$$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$$

subject to :

(*i*) $u(0, t) = 0$

(*ii*) $u(l, t) = 0$

(*iii*) $u(x, t)$ is finite as $t \to \infty$

(*iv*) $u(x, 0) = 2x$ for $0 < x < l$.

(*b*) In a heat exchange the temperatures x and y of two liquids satisfy the equations :

$$\frac{dx}{dt} + y = \sin t; \quad \frac{dy}{dt} + x = \cos t$$

with $x = 2$ and $y = 0$ for $t = 0$. [8]

Or

4. (*a*) Solve : [8]

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

for $0 \le x \le \pi$, $0 \le y \le \pi$ such that :

(*i*) $u(0, y) = 0$

(*ii*) $u(\pi, y) = 0$

(*iii*) $u(x, 0) = 0$

(*iv*) $u(x, \pi) = \sin 2x$, $0 \le x \le \pi$.

(*b*) Solve : [8]

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$$

subject to the conditions :

(*i*) $u(0, t) = 0$ for all t

(*ii*) $u(l,\ t) = 0$ for all t

(*iii*) $\left.\frac{\partial u}{\partial t}\right|_{t=0} = 0$

(*iv*) $u(x,\ 0) = a \sin \frac{\pi x}{l}$.

5. (*a*) Find Fourier sine transform of $e^{-|x|}$. Hence show that : [6]

$$\int_0^\infty \frac{x \sin ax}{1 + x^2} dx = \frac{\pi}{2} e^{-a}, \quad a > 0.$$

(*b*) Using Fourier integral representation, show that : [6]

$$\int_0^\infty \frac{\sin \pi\alpha}{1 - \alpha^2} \sin \alpha x \ d\alpha = \begin{cases} \frac{\pi}{2} \sin x & 0 \le x \le \pi \\ 0 & x \ge \pi \end{cases}$$

(*c*) Find Fourier transform of : [5]

$$f(x) = \begin{cases} 1/2 & \text{for } |x| < 1 \\ 0 & \text{for } |x| > 1 \end{cases}$$

Hence evaluate :

$$\int_0^\infty \frac{\sin x}{x} dx.$$

Or

6. (*a*) Find Fourier integral representation of : [6]

$$f(x) = \begin{cases} \cos x & |x| \le \pi \\ 0 & |x| > \pi \end{cases}$$

(*b*) Find Fourier cosine transform of : [5]

$$f(x) = \begin{cases} 2x^2 & 0 < x < a \\ 0 & x > a \end{cases}$$

(*c*) Using Fourier sine transform, solve the heat equation : [6]

$$\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2},$$

$0 < x < \infty$, $t > 0$ such that :

(*i*) $u(0, t) = 0, \ t > 0$

(*ii*) $u(x, 0) = e^{-x}, \ x > 0$

(*iii*) $u \to 0$ and $\frac{\partial u}{\partial x} \to 0$ as $x \to \infty$.

SECTION II

7. (*a*) Obtain Laplace transform of (any *three*) : [12]

(*i*) $\frac{1 - \cos t}{t}$

(*ii*) $\int_0^t t \sinh t \ dt$

(*iii*) $e^{2t}(3\cos 4t + 5\sin 6t)$

(*iv*) $t \cup (t - 4) - t^3\delta(t - 2)$.

(*b*) Using Laplace transform evaluate : [4]

$$\int_0^\infty e^{-2t} t \sin t \ dt.$$

Or

8. (*a*) Obtain Inverse Laplace transform of (any *three*) : [12]

(*i*) $\tan^{-1}(s)$

(*ii*) $\dfrac{s+1}{s^2+2s+2}$

(*iii*) $\dfrac{s}{(s-1)(s+1)(s-2)}$

(*iv*) $\dfrac{s}{(s^2+1)^2}$.

(*b*) Use convolution theorem to find the Inverse Laplace transform of : [4]

$$\frac{s}{(s+2)(s^2+1)}.$$

9. (*a*) Find the directional derivative of $\phi = xy^2 + yz^2$ at $(2, -1, 1)$ in the direction of vector $2\bar{i} + \bar{j} + 3\bar{k}$. [6]

(*b*) Prove that :

$$\bar{F} = 2xyz^2\ \bar{i} + \left(x^2z^2 + z\cos yz\right)\bar{j} + \left(2x^2yz + y\cos yz\right)\bar{k}$$

is irrotational and find scalar field ϕ such that $\bar{F} = \nabla\phi$. [6]

(*c*) Use Stokes' theorem to evaluate :

$$\int_C \sin z\ dx - \cos x\ dy + \sin y\ dz$$

where C is boundary of rectangle $0 \le x \le \pi$, $0 \le y \le 1$, $z = 3$. [6]

Or

10. (*a*) Show that (any *two*) : [6]

(*i*) $\nabla \cdot \left(\frac{\bar{a} \times \bar{r}}{r} \right) = 0$

(*ii*) $\bar{a} \cdot \nabla \left[\bar{b} \cdot \nabla \frac{1}{r} \right] = \frac{3 \left(\bar{a} \cdot \bar{r} \right) \left(\bar{b} \cdot \bar{r} \right)}{r^5} - \frac{\bar{a} \cdot \bar{b}}{r^3}$

(*iii*) $\nabla^2 f(r) = \frac{d^2 f}{dr^2} + \frac{2}{r} \frac{df}{dr}$.

(*b*) Evaluate : [5]

$$\int_C \bar{F} \cdot d\bar{r}$$

where :

$$\bar{F} = (2y + 3)\, \bar{i} + xz\, \bar{j} + (yz - x)\, \bar{k}$$

and C is the curve $x = 2t^2$, $y = t$, $z = t^3$ from $t = 0$ to $t = 1$.

(*c*) By using Gauss Divergence theorem evaluate : [7]

$$\iint \left(x^3\, \bar{i} + y^3\, \bar{j} + z^3\, \bar{k} \right) \cdot d\bar{s}$$

over the surface of sphere $x^2 + y^2 + z^2 = 16$.

11. (*a*) Solve : [5]

$$\frac{d^2 x}{dt^2} + 3 \frac{dx}{dt} = 2x(t) = t\, \delta(t - 1),\ x(0) = x'(0) = 0$$

using Laplace transform.

(*b*) Show that the velocity potential :

$$\phi = \frac{a}{2}\left(x^2 + y^2 - 2z^2\right)$$

satisfies Laplace's equation. Also determine the streamlines. [5]

(*c*) The transfer function of a second order system is given as :

$$G(s) = \frac{6}{s^2 + 1.8s + 1}.$$

Find overshoot, period of oscillation and $y(t)_{max}$. [6]

Or

12. (*a*) Solve :

$$\frac{dy}{dt} + 3y(t) + 2\int_0^t y(t)\,dt = t, \quad y(0) = 0$$

using Laplace transform. [5]

(*b*) Obtain the equation of streamline in case of steady motion of fluid defined by : [5]

$$\bar{q} = (y - xz)\,\bar{i} + (yz + x)\,\bar{j} + \left(x^2 + y^2\right)\bar{k}.$$

(*c*) A step change of magnitude is introduced into the transfer function :

$$G(s) = \frac{Y(s)}{X(s)} = \frac{10}{2s^2 + 0.3s + 0.5}$$

Determine the overshoot, period of oscillation and maximum value of $y(t)$. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-172

S.E. (Chemical) (First Sem.) EXAMINATION, 2015

CHEMISTRY–I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat labelled diagrams must be drawn, wherever necessary.

(*iv*) Use of logarithmic tables, slide rule, Mollier chart, pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Discuss the following with suitable example : [6]

(*i*) Electophiles

(*ii*) Nucleophiles.

P.T.O.

(*b*) Draw and describe molecular orbital diagram and find the bond order for CO molecules. [6]

(*c*) Explain the structure and stability of free radical. [4]

Or

2. (*a*) Name the various types of organic reaction. Explain substitution reaction with suitable example. [6]

(*b*) Give reasons for the following : [6]

(*i*) Pyridine is a weaker base than pyrrole.

(*ii*) Aniline is weaker base than aliphatic amines.

(*c*) Draw the resonating structure of : [4]

(*i*) Nitrobenzene

(*ii*) Phenol.

3. (*a*) Explain why—SO_3H is deactivating and meta director ? [6]

(*b*) Give the mechanism of sulphonation of benzene. [6]

(*c*) Write short note on Claisen rearrangement. [4]

Or

4. (*a*) Give the mechanism of E_1 and E_2 elimination. [6]

(*b*) Explain why alkenes undergoes addition reaction whereas benzene undergoes electrophilic substitution reaction. [6]

(*c*) Write short note on Beckmann rearrangement. [4]

5. (*a*) Explain the principle and instrumentation of Flame photometry. [6]

(*b*) Explain Kohlrausch's law of independent migration of ions. Mention its application. [6]

(*c*) What is an ion selective electrode ? Explain construction and application of gas sensing electrode. [6]

Or

6. (*a*) Describe the titration curves in conductometric titration for the following : [6]

(*i*) Weak acid with strong base

(*ii*) Strong acid with strong base.

(*b*) Write a short on potentiometric titration. [6]

(*c*) Describe the method for conductance measurement. Explain their advantages. [6]

SECTION II

7. (*a*) Describe the Stark-Einstein law of photochemical equivalence. [4]

(*b*) Derive equation for velocity coefficient of a bimolecular reaction with different initial concentration. [6]

(*c*) Ethyl acetate saponification with equal concentration of the ester and alkali gave following data. Show that the reaction is second order. How much fraction will react in 40 min ? [6]

Time (min.) t	**0.1 N acetic acid for 10 ml mixture**
0	16
5	10.2
25	4.3
55	2.3
∞	0

Or

8. (*a*) Write a short note on Quantum yield of a photochemical reaction. [4]

(*b*) Quantum efficiency of photochemical reaction between H_2 and Cl_2 is 10^5, with wavelength of 4800 Å. Calculate the number of moles of HCl formed from 1 joule of the energy. [6]

(*c*) Derive the Arrhenius equation and explain energy of activation. [6]

9. (*a*) State the applications of column chromatography. [4]

(*b*) Write a note on PEMFC. [6]

(*c*) Describe the instrumentation of TLC Chromatography. [6]

Or

10. (*a*) Explain applications of Gas Chromatography. [4]

(*b*) Write a short note on Nickel-Cadmium battery. [6]

(*c*) Explain in detail the principle, technique and appplications of TLC. [6]

11. (*a*) Describe the method of synthesis for the following dyes : [6]

(*i*) Alizarin

(*ii*) Phenolphthalein.

(*b*) Write a short note on diazotization and coupling in azo dyes. [6]

(*c*) Explain the following : [6]

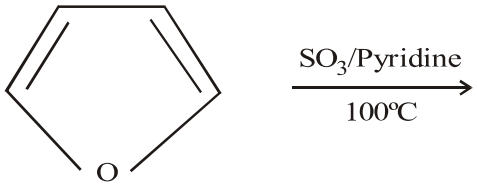
(*i*) Electrophilic substitution in five membered heterocycles.

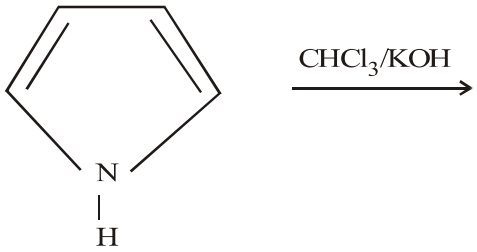
(*ii*) Pyridine is more basic than pyrrole.

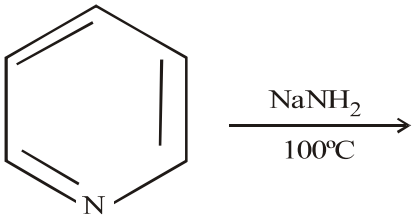
(*iii*) Furan is more reactive than benzene in electrophilic substitution.

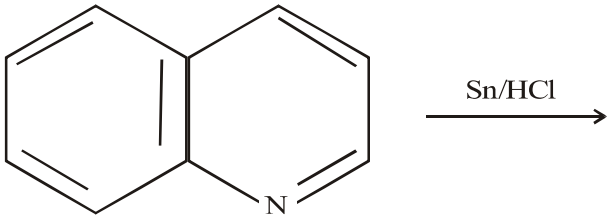
Or

12. (*a*) Write the organic product(s) of the followings reactions : [4]

(*i*) 

(*ii*) 

(*iii*) 

(*iv*) 

(*b*) Write a short note on Otto Witts (chromophore-auxochrome) theory of colour. [8]

(*c*) Draw orbital picture of pyrrole, furan and pyridine. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-173

S.E. (Chemical Engineering) (First Semester)

EXAMINATION, 2015

CHEMICAL ENGINEERING FLUID MECHANICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the *two* sections should be written in separate answer books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Answer the following : [6]

(*i*) What are the properties of ideal fluid ?

(*ii*) Define specific volume and specific gravity.

(*iii*) Give suitable examples for Bingham plastic fluid and Thixotropic fluid.

P.T.O.

(*b*) Show that equipotential line and streamlines are perpendicular to each other. [6]

(*c*) Define and distinguish between kinematic viscosity and dynamic viscosity. [6]

Or

2. (*a*) Discuss various chemical engineering applications of fluid mechanics. [6]

(*b*) What is rheology ? How are fluids classified according to their Rheological behaviour ? [6]

(*c*) Discuss the following : [6]

(*i*) Laminar and turbulent flow

(*ii*) Steady and unsteady flow

(*iii*) Rotational and irrotational flow.

3. (*a*) Derive an expression for the pressure difference across two limbs of a differential manometer containing two gauge fluids, mutually immiscible. What factors influence the sensitivity ? [8]

(*b*) Derive two-dimensional steady state flow of incompressible fluid. [8]

Or

4. (*a*) Derive Euler's equation of motion. [8]

(*b*) Derive Bernoulli's equation of mechanical energy. List the assumptions. [8]

5. (*a*) For laminar flow through circular pipe prove that the kinetic energy correction $\alpha = 02$. [8]

(*b*) Derive expression for laminar flow through inclined circular pipe. [8]

Or

6. (*a*) Derive expression for laminar flow through horizontal circular pipe. [8]

(*b*) Derive Hagen-Poiseuille equation, highlighting the assumption made. [8]

SECTION II

7. (*a*) With suitable example, describe in detail the method of dimensional analysis using Buckingham's π theorem. [10]

(*b*) Define the following thickness of boundary layer : [8]

(*i*) Nominal thickness

(*ii*) Displacement thickness

(*iii*) Momentum thickness

(*iv*) Energy thickness.

Or

8. (*a*) Distinguish between units and dimensions. [4]

(*b*) Define : [6]

(*i*) Fundamental and derived quantities

(*ii*) Dimensions of physical quantity.

(*c*) Derive the continuity and Euler's equation of motion for boundary layer. [8]

9. (*a*) Differentiate between loading and flooding. How will you estimate the flooding velocity in a packed column ? [8]

(*b*) Explain the different types of fluidization and state conditions. State commercial applications of fluidized bed. [8]

Or

10. (*a*) Derive Ergun equation for pressure drops through a packed bed. [8]

(*b*) Derive an expression for minimum fluidization velocity. [8]

11. (*a*) Explain phenomenon of cavitations in pumps. How can it be prevented ? [4]

(*b*) Enlist different minor losses and major losses in pipe-lines. [4]

(*c*) Derive equation for flow through venturimeter. [8]

Or

12. (*a*) Explain operating characteristics of a centrifugal pump. [8]

(*b*) Define stagnation point and stagnation pressure in the pitot tube. [4]

(*c*) Classify fluid flowmeters. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-174

S.E. (Chemical) (I Sem.) EXAMINATION, 2015

CHEMICAL ENGINEERING MATERIALS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Your answers will be valued as a whole.

(*vi*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

SECTION I

1. (*a*) Write the classification of Engineering Materials. [6]

(*b*) A steel rod of 30 mm diameter, 280 mm long is subjected to axial forces alternating between maximum compression of 15 kN and a maximum tension of 5 kN. Find the difference between the greatest and least length of the rod. E = 210 GPa. [10]

P.T.O.

Or

2. (*a*) Define the following terms (any *three*) : [12]

(*i*) Resilience

(*ii*) Hardness

(*iii*) Shear stress

(*iv*) Factor of safety

(*v*) Necking.

(*b*) Draw and explain stress-strain curve for ductile materials. [4]

3. (*a*) Write the difference between destructive and non-destructive hardness test. [4]

(*b*) Explain various types of Impact test. [12]

Or

4. What are the different types of Hardness testing methods ? Explain any *two* methods in detail. [16]

5. Draw Iron-iron Carbide equilibrium diagram. Explain various reactions involved and different phases involved. [18]

Or

6. (*a*) Explain the following terms : [12]

(*i*) Insulations

(*ii*) Refractories

(*iii*) Types of steel.

(*b*) Explain the Rolling and Riveting process in detail. [6]

SECTION II

7. (*a*) Write short notes on : [8]

(*i*) Dry corrosion

(*ii*) Wet corrosion.

(*b*) Explain in detail any *two* methods of prevention of corrosion. [8]

Or

8. (*a*) Give and explain any *four* types of corrosion. [10]

(*b*) What is an oxide film ? Explain its formation and growth mechanism. [6]

9. Explain the following : [16]

(*i*) Natural and synthetic polymers

(*ii*) Nylon-6

(*iii*) Applications of polymers

(*iv*) Stress relaxation.

Or

10. (*a*) Define polymerization. Explain addition and condensation polymerization. [8]

(*b*) Define the term 'stereoisomerism'. [4]

(*c*) Explain elastic and plastic deformation of polymers. [4]

11. (*a*) Write a short note on Glass and its types. [6]

(*b*) Define ceramic materials. Write applications of ceramic materials. [6]

(*c*) Explain the term Refractories materials. [6]

Or

12. Write short notes on (any *three*) : [18]

(*i*) Vitrification process

(*ii*) Mechanical properties of ceramic

(*iii*) Applications of ceramic material

(*iv*) Cement

(*v*) Clays

(*vi*) Borosilicate.

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-175

S.E. (Chemical Engineering) (First Semester) EXAMINATION, 2015
PROCESS CALCULATIONS
(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-book.

(*ii*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data if necessary.

SECTION I

1. (*a*) A gaseous mixture has the following composition by volume : CO_2 = 8%, CO 14%, O_2 = 6%, H_2O = 5%, CH_4 = 1% and N_2 = 66%. Calculate the average molecular weight of the gas mixture, the density of the gas at 303 K and 101.325 kPa. [6]

P.T.O.

(*b*) A mixture of CH_4 and C_2H_6 has a density of 1 kg/m^3 at 273 K and 101.325 kPa. Calculate the mole% and weight% of the two components in the mixture. [6]

(*c*) The nitrogen content of NH_4NO_3 sample is 34.5% by weight. Find the actual ammonium nitrate in the sample. [6]

Or

2. (*a*) A solution containing 55% benzene, 28% toluene and 17% xylene by weight is in contact with its vapour at 373 K. Calculate total pressure and molar composition of the liquid and vapour. Vapour pressure data at 373 K : benzene = 178.6 kPa, toluene = 74.6 kPa and xylene = 28 kPa. [10]

(*b*) A mixture of H_2 and O_2 contains 11.1% H_2 by weight. Calculate the average molecular weight of the mixture and partial pressure of the two components at 100 kPa and 303 K. [8]

3. (*a*) A waste acid contains 30% H_2SO_4, 35% HNO_3 and 35% water. This is to be concentrated to contain 39% H_2SO_4 and 42% HNO_3 by addition of sulphuric acid containing 98% H_2SO_4 and Nitric acid containing 72% HNO_3. Calculate the quantities of all the acids for obtaining 1000 kg of desired mixed acid. [8]

(*b*) An effluent sample from a plant contains formaldehyde (HCHO) and methanol (CH_3OH). Analysis of the sample shows that for the sample total organic carbon (TOC) = 258.3 mg/l and theoretical oxygen demand (ThOD) is 956.5 mg/l. Find the concentration of each in mg/l. [8]

Or

4. (*a*) Feed water to a reverse osmosis plant has dissolved solids to an extent of 5000 ppm. Feed to product ratio is 4 : 3 by weight. Treated water leaving the plant contains 600 ppm solids. Find the solid content of the reject stream. [8]

(*b*) A mixed fertilizer is to be made having a composition 10 : 26 : 26 as % N_2, %P_2O_5 and %K_2O by mixing ammonia, phosphoric acid and KCl, all 100% pure. Calculate amount of each of them for making 100 kg of the mixture. (Atomic weight : N = 14, P = 31, K = 39, O = 16). [8]

5. (*a*) Define limiting component, conversion, yield and selectivity. [8]

(*b*) A combustion chamber is fed with butane and excess air. Combustion of butane is complete. The product gas has a composition : 9.39% CO_2, 4.7% O_2, 11.73 H_2O and rest N_2 by volume. Find the % excess air used. [8]

Or

6. (*a*) A feed containing 60 mol% A, 30 mol% B and 10 mol% inerts enters a reactor. The product stream leaving the reactor contains 2 mole% A. The reaction taking place is $2A + B \rightarrow C$. Find the percentage of A converted. [8]

(*b*) What are the advantages of using recycle. [4]

(*c*) Explain bypass operations and their advantages. [4]

SECTION II

7. (*a*) Define heat of dilution, heat of reaction, heat of vaporization specific heat and sensible heat. [10]

(*b*) Pure ethylene is heated from 303 K to 523 K. Calculate the amount of heat added per kmol of ethylene if its specific heat is given by the equation :

$C_P^0 = 4.1261 + 155.0213 \times 10^{-3}T - 81.5455 \times 10^{-6}T^2 + 16.9755 \times 10^{-9}T^3$ kJ/kmol K, T is in K. [8]

Or

8. (*a*) Explain the effect of temperature on heat of reaction. [5]

(*b*) Calculate the heat of formation of benzoic acid crystals ($C_7H_6O_2$) at 298.15 K using the following data : Standard heat of formation of CO_2 (g) = –393.51 kJ/mol, Standard heat of formation of H_2O(l) = –285.83 kJ/mol, Standard heat of combustion of benzoic acid crystals = –3226.95 kJ/mol. [5]

(*c*) Methane is oxidized with air to produce formaldehyde : $CH_4(g) + O_2(g) \rightarrow HCHO(g) + H_2O(g)$. ΔH_R^0 = –283.094 kJ/mol. 100 mol of methane are fed to the reactor at 311 K, air is used in 50% excess and supplied at 373 K. If conversion is 60%, calculate the heat that must be removed from the product stream to emerge at 478 K. Data : C^0_{pm} for air (373 – 298 K) = 29.2908 kJ/kmol K [8]

Component	**C^0_{pm}(311 – 298 K) kJ/kmol K**	**C^0_{pm}(478 – 298 K) kJ/kmol K**
CH_4	36.044	40.193
N_2	—	29.2866
O_2	—	30.0821
HCHO	—	41.2902
H_2O	—	34.2396

9. (*a*) A solution of potassium dichromate in water contains 15% solute by weight. Calculate the amount of $K_2Cr_2O_7$ obtained as crystals that can be produced from 1500 kg of solution if 700 kg of water is evaporated and remaining solution is cooled to 293 K. Solubility of $K_2Cr_2O_7$ in water is 115 kg per 1000 kg of water. [8]

(*b*) NH_3–air mixture containing 0.2 kg ammonia per kg air enters an absorption tower where ammonia is absorbed in water. The gas leaving the tower is found to contain 0.004 kg ammonia per kg air. Find the percentage recovery of ammonia. [4]

(*c*) Define humidity, dew point and relative humidity. [4]

Or

10. (*a*) 2000 kg of wet solids containing 70% moisture by weight are fed to a dryer where the moisture content is reduced to 1%. Find the amount of moisture removed and mass of product obtained. [4]

(*b*) Soyabean seeds are extracted with hexane in a batch extractor. The flaked seeds are found to contain 18% oil, 60% solids and 12.4% moisture by weight. After extraction the solid product

is separated from the solution of hexane and oil. The solid remaining is found to contain 0.8% oil, 87.7% solids and 11.5% moisture. Calculate the percentage recovery of oil. [8]

(*c*) Define tie component, humid volume and wet bulb temperature. [4]

11. (*a*) The Orsat analysis of flue gases leaving a furnace contains 10.6% CO_2, 6% O_2 and rest N_2 by volume. Find the C : H ratio in the fuel oil assuming fuel oil does not contain any oxygen or nitrogen. Also calculate the percentage excess air. [8]

(*b*) Define % excess air, HCV, LCV and adiabatic flame temperature. [8]

Or

12. (*a*) Explain ultimate analysis in detail. [8]

(*b*) A sample of coke is found to contain 90% carbon and 10% non-combustible ash by weight. For 100 kg coke how many mole of oxygen are required theoretically ? If 50% excess air is used give the analysis of flue gases. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-176

S.E. (Chemical) (Second Semester) EXAMINATION, 2015

CHEMISTRY–II

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right side indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What is a zeolite catalyst ? Give its types. Explain structure of sodalite as building block of zeolites. [6]

(*b*) Give mechanism of metal co-ordination compound catalyse reactions in : [6]

(*i*) Vinyl acetate from ethylene

(*ii*) Wacker process.

P.T.O.

(*c*) What are the types of adsorption isotherms ? Explain them briefly. [6]

Or

2. (*a*) What are the types of catalysis ? Explain the heterogeneous catalysis with suitable examples. [9]

(*b*) Explain the terms :

(*i*) Activation energy

(*ii*) Enzyme catalysis

(*iii*) Adsorption isotherm. [9]

3. (*a*) How does glucose react with : [6]

(*i*) HNO_3

(*ii*) Acetic anhydride

(*iii*) Phenyl hydrazine ?

(*b*) What is a zwitter ion ? Describe the isoelectric point. [6]

(*c*) Define the following terms with examples and functions : [4]

(*i*) Enzyme

(*ii*) Co-enzyme.

Or

4. (*a*) Write a short note on mutarotation. [4]

(*b*) Define carbohydrates. Give the classification of carbohydrates. [6]

(*c*) Explain the primary and secondary structure of proteins. [6]

5. (*a*) Define and shortly explain the following terms :

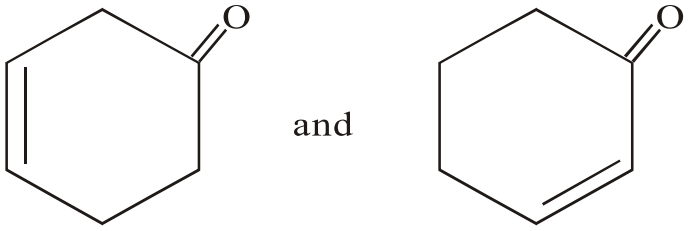
(*i*) Chromophore

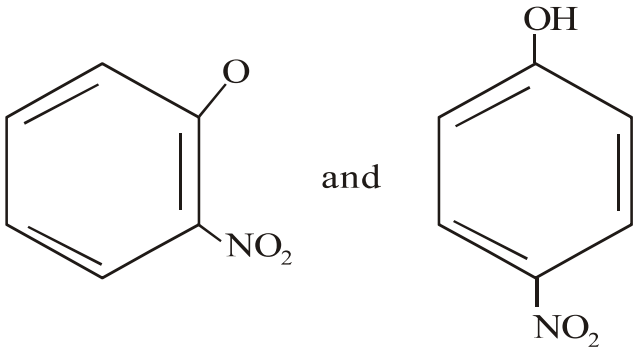
(*ii*) Auxochrome

(*iii*) Bathochromic shift

(*iv*) Hypsochromic shift. [6]

(*b*) How will you distinguish the following pairs from each other by IR absorption ? [6]

(*i*) 

(*ii*) 

(*c*) Explain UV spectra are broader than IR spectra. [4]

Or

6. (*a*) Give the various applications of UV and IR spectroscopy. [6]

(*b*) Show the fundamental vibration modes for H_2O molecule and CO_2 molecule. [6]

(*c*) Explain ethanol can be used as a solvent for UV but not acetone. [4]

SECTION II

7. (*a*) Define the following terms giving suitable examples : [6]

(*i*) Complex compound

(*ii*) Double salt

(*iii*) Ligand.

(*b*) Explain giving reasons, why : [6]

(*i*) Most of the transition metals are paramagnetic

(*ii*) Compounds of transition metals exhibit variable valency.

(*c*) What are the important postulates of Werner's Theory ? [6]

Or

8. (*a*) Write a short note on low spin and high spin complexes. [6]

(*b*) On the basis of valence bond theory explain the structures of :

(*i*) $[Mn(CN)_6]^{4-}$

(*ii*) $[Fe(CO)_5]$. [6]

(*c*) How do you explain the anomalous electronic configuration of copper and chromium. [6]

9. (*a*) Define the following terms with suitable examples : [6]

(*i*) Atom economy

(*ii*) % yield

(*iii*) Environment load factor E.

(*b*) Explain the various types of fermentations. [6]

(*c*) Give the traditional and greener routes for the synthesis of Adipic acid. [4]

Or

10. (*a*) State the basic principles involved in green chemistry and explain any *one*. [6]

(*b*) Explain fouling of membrane and state, how it can be overcome ? [6]

(*c*) What is biotechnology ? State its importance. [4]

11. (*a*) Draw general layout of municipal waste water treatment plant and explain preliminary treatment. [6]

(*b*) What is tanning ? Write a note on quality of tannery industry waste water treatment. [6]

(*c*) Write a note on disposal of hazardous waste. [4]

Or

12. (*a*) Define BOD. Deduce an expression for the first stage BOD. [6]

(*b*) Write a note on reverse osmosis and electrodialysis. [6]

(*c*) Discuss treatment for dairy industry waste water. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-177

S.E. (Chemical) (Second Semester) EXAMINATION, 2015

CHEMICAL ENGINEERING THERMODYNAMICS—I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answer to the two sections should be written in separate answer books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Nitrogen gas is confined in a cylinder and its pressure is maintained by a weight placed on the piston. The mass of piston and the weight together is 100 kg the acceleration due to gravity

P.T.O.

is 9.81 m/s^2 and the atmospheric pressure is 1.01325 bar. Assuming frictionless piston, find : [8]

(*i*) The force exerted by the atmosphere, the piston, and the weight on the gas, if the piston is 200 mm diameter.

(*ii*) The pressure of gas

(*iii*) The work done by the gas, if the gas is allowed to expand pushing up piston and the weight by 500 mm.

(*iv*) What is the change in the potential energy of the piston and the weight after the expansion in part(c) ?

(*b*) An elevator of mass 2500 kg rests at a level of 10 m above the base of an elevator shaft. The elevator is raised to a height of 100 m from the base of shaft; where the cable holding it breaks. It falls freely to the base where it is brought to rest by a strong spring. The spring is designed to bring the elevator to rest and by means of a catch arrangement, to hold the elevator at the position of maximum spring compression. Assuming the entire process to be frictionless, and taking g = 9.81 m/s^2, calculate : [8]

(*i*) The potential energy of the elevator in its initial position relative to the base of the shaft.

(*ii*) The work done raising the elevator.

(*iii*) The potential energy of the elevator in its highest position relative to the base of the shaft.

(*iv*) The velocity and kinetic energy of the elevator just before it strikes the spring.

Or

2. (*a*) Derive mathematical of first law of thermodynamics that can be used for solving steady fluid flow problems. [8]

(*b*) Differentiate between : [8]

(*i*) Path function and point function.

(*ii*) Macroscopic approaches and microscopic approaches.

3. An ideal gas initially at 600 K and 10 bar undergoes a four step mechanically reversible cycle in a closed system. In step 12, pressure decreases isothermally to 3 bar, in step 23 pressure descrease at constant volume to 2 bar, in step 34 volume decreases at constant pressure and in step 41, the gas returns adiabatically to its initial state.

Calculate Q, W, ΔE and ΔH for each step of cycle.

Data : $C_P = (7/2)R$, $C_V = (5/2)R$. [16]

Or

4. (*a*) Derive the expression for work done and heat transferred for a polytropic process. [8]

(*b*) Explain P-V diagram for pure substance. [8]

5. Methanol is synthesized according to the following reaction : [18]

$$CO_{(g)} + 2H_{2(g)} \rightarrow CH_3OH_{(g)}$$

The standard heats of formation at 298 K are –110.525 kJ/mol for CO and –200.600 kJ/mol for methanol. The specific heats are given as :

$C_P(CH_3OH) = 2.211 + 12.216 \times 10^{-3}T - 3.450 \times 10^{-6}T^2$

$C_P(CO) = 3.376 + 0.557 \times 10^{-3}T - 0.031 \times 10^{5}T^{-2}$

$C_P(H_2) = 3.249 + 0.422 \times 10^{-3}T + 0.083 \times 10^{5}T^{-2}$

Calculate the standard heat of reaction at 1073 K.

Or

6. (*a*) Explain different methods for rough estimation of latent heats of vaporisation for pure liquids. [8]

(*b*) Explain : [10]

(*i*) Hess's law of constant heat summation

(*ii*) Heat of reaction

(*iii*) Heat of formation

(*iv*) Heat of combustion.

SECTION II

7. (*a*) Give the general statements of the second law of thermodynamics. [8]

(*b*) A steel casing at a temperature 725 K and weighing 35 kg is quenched in 150 kg oil at 275 K. If there are no heat losses, determine the change in the entropy. The specific heat (C_P) of steel is 0.88 kJ/kg K and that of oil is 2.5 kJ/kgK. [8]

Or

8. (*a*) Oil at 500 K is to be cooled at a rate of 5000 kg/h in a counter-current exchanger using cold water available at 295 K. A temperature approach of 10 K is to be maintained at both ends of the exchanger. The specific heats of oil and water are respectively 3.2 and 4.2 kJ/kg K. Determine the total entropy change in the process. [8]

(*b*) Derive the following relation for the efficiency of Carnot engine. [8]

9. (*a*) Derive Maxwell Relations. [10]

(*b*) Explain the terms volume expansivity, isothermal compressibility and adiabatic compressibility. [6]

Or

10. (*a*) Derive Clausius-Clapeyron equation for vapour liquid two-phase system. [8]

(*b*) Explain residual properties. Derive the following fundamental residual property relation for 1 mol of a substance for closed thermodynamic system : [8]

$$\frac{dG^R}{RT} = V^R \frac{dP}{dT} - H^R \frac{dT}{RT^2}.$$

11. (*a*) A house has a winter heating requirement of 30 kW and a summer cooling requirement of 60 kW. Consider a heat-pump installation to maintain the house temperature at 293 K in winter and 298 K in summer. This requires circulation of the refrigerant through interior exchanger coils at 303 K in winter and 278 K in summer. Underground coils provide the heat source in winter and the heat sink in summer. For a year round ground temperature of 288 K, the heat-transfer characteristics of the coils necessitate refrigerant temperature of 283 K in winter and 298 K in summer. What are the minimum power requirements for winter heating and summer cooling ? [10]

(*b*) Explain absorption refrigeration cycle. [8]

Or

12. (*a*) A Carnot engine is coupled to a Carnot refrigerator, so that all the work produced by the engine is used by the refrigerator in extraction of heat from a heat reservoir at 0°C at the rate of 35 kW. The source of energy for the Carnot engine is a heat reservoir at 25°C. If both devices discard heat to the surrounding at 25°C, how much heat does the engine absorb from its heat source reservoir ?

If the actual coefficient of performance of the refrigerator $COP_{actual} = 0.6\ COP_{Carnot}$ and if the thermal efficiency of the engine is $h_{actual} = 0.6\ h_{Carnot}$, how much heat does the engine absorb from is heat source reservoir. [10]

(*b*) Why is liquefaction of gas needed ? Explain the Linde process for gas liquefaction. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-178

S.E. (Chemical) (Second Semester)

EXAMINATION, 2015

HEAT TRANSFER

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Figures to the right side indicate full marks.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Assume suitable data if necessary.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.

SECTION I

1. (*a*) Explain in detail 'Modes of heat transfer'. [3]

(*b*) Define and explain :

(*i*) Fourier law of heat conduction

(*ii*) Newton's law of cooling

(*iii*) Stefan-Boltzmann's law of radiation. [9]

(*c*) Explain Rayleigh's method of dimensional analysis. [6]

P.T.O.

Or

2. (*a*) Derive the following relationship for forced convection heat transfer process by dimensional analysis : [8]

$Nu = c\ [Re^a Pr^b]$

where :

Nu = Nusselt number

Re = Reynolds number

Pr = Prandtl number

a, *b* and *c* are numerical constants.

(*b*) Give significance of Grasshoff number and Nusselt number. [4]

(*c*) Explain 'Buckingham's π theorem for dimensional analysis. [6]

3. (*a*) Derive an expression for steady state rate of heat flow through composite cylinder. [8]

(*b*) A composite wall consists of three layers with thickness of 5 cm, 10 cm and 18 cm, having thermal conductivities 1.28, 0.58 & 0.42 W/m-K respectively. The heat transfer coefficient on inner side is 22 W/m^2 K and on outer side is 10 W/m^2C. Calculate the rate of heat loss per unit area if temperatures are 3500 K and 3000 K on inner and outer side respectively. What are steady state temperatures at interfaces of all three layers ? [8]

Or

4. (*a*) Derive an expression for the rate of heat transfer through a composite plane wall considering of three heterogeneous layers having thermal conductivities k_1, k_2 and k_3 respectively. [8]

(*b*) Calculate the critical radius of insulation for asbestos (k = 0.17 W/m°K) surrounding a pipe and exposed to ambient air at 20°C with h = 3.0 W/m^{2}K. Calculate heat loss from pipe of 5.0 cm diameter at 200°C, when covered with the critical radius of insulation. [8]

5. (*a*) What is convective heat transfer ? Differentiate between natural convection and forced convection. [8]

(*b*) A horizontal pipe 1 ft (0.3048 m) in diameter is maintained at a temperature of 250°C in a room, where the ambient air is at 15°C. Calculate the free convection heat loss per meter of length. Data : Air properties at film temperature 405.5 K,

K = 0.03406 W/m°C,

Kinematic viscosity = 26.54 × 10^{-6} m^2/s,

Prandtl No. = 0.687. [8]

Or

6. (*a*) Explain Pool boiling curve with neat sketch. [6]

(*b*) Write short note on any *one* : [4]

(*i*) Thermal boundary layer

(*ii*) Individual and overall heat transfer coefficient.

(*c*) Differentiate between filmwise and dropwise condensation. [6]

SECTION II

7. (*a*) Two very large parallel planes with emissivities 0.8 and 0.7 exchange the heat. Estimate the percent reduction in heat transfer when a polished aluminium radiation shield with emissivity 0.03 is placed between them. [8]

(*b*) Explain the concept of black-body. [4]

(*c*) Explain specular and diffuse reflection. [4]

Or

8. (*a*) Define : [4]

(*i*) Wien's Displacement law

(*ii*) Kirchhoff's law.

(*b*) Explain the Radiation shield. [4]

(*c*) Define :

(*i*) Irradiation

(*ii*) Radiosity

(*iii*) Monochromatic emissivity

(*iv*) Emissive power. [8]

9. (*a*) Explain shell and tube heat exchanger in detail with neat sketch. [8]

(*b*) It is required to cool 250 kg/hr of hot liquid with inlet temperature of 393°K using parallel flow arrangement 1000 kg/hr of cooling water is available for cooling purpose at a temperature of 283°K. Taking overall heat transfer coefficient of 1160 W/m^{2}K and heat transfer surface area of 0.25 m^2, calculate the outlet temperature of liquid and water and the effectiveness of heat exchanger.

Data :

Specific heat of water = 4187 J/kg°K

Specific heat of liquid = 3350 J/kg°K. [8]

Or

10. (*a*) Discuss on the Log mean temperature difference. [4]

(*b*) Define effectiveness and capacity ratio of heat exchanger. [4]

(*c*) Explain :

(*i*) The overall heat transfer coefficient

(*ii*) Fouling factor. [8]

11. (*a*) Explain the construction and working of Calendria type evaporator with neat sketch. [8]

(*b*) Define :

(*i*) Capacity of evaporator

(*ii*) Steam economy of evaporator. [4]

(*c*) Explain Boiling point elevation and Duhring's rule. [4]

Or

12. (*a*) A single effect evaporator is used to concentrate 20000 kg/hr of a solution at 298 K from 5% to 20% by weight of salt concentration. Steam is fed to the evaporator at pressure corresponding to the saturation temperature of 399 K. The evaporator is operating at atmospheric pressure and boiling point rise is 7 K. Calculate the heat load, the steam consumption and steam economy. [10]

Data :

Specific heat of feed : 4.0 kJ/(kg.K)

Latent heat of condensation of steam at 399 K = 2185 kJ/kg

Latent heat of vaporization of water at 373 K = 2257 kJ/kg

(*b*) Draw and explain the forward feed multiple effect evaporator. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4757]-179

S.E. (Chemical) (II Sem.) EXAMINATION, 2015

PRINCIPLES OF DESIGN

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Sketch and explain stress-strain curve for ductile materials. Indicate important stresses on the curve. [6]

(*b*) A metal rod of 20 mm diameter is subject to axial compressive force of 5 kN. Calculate stress induced and strain in the rod. Also calculate change in length and diameter of rod if $E = 2 \times 10^5$ MPa, $\mu = 0.28$. [6]

P.T.O.

(*c*) With neat sketches explain different types of keys used to fasten pulley on the shaft. [6]

Or

2. (*a*) Define — proportionality limit, elastic limit, yield stress, ultimate stress, factor of safety, breaking stress. [6]

(*b*) A metal rod having 2 mm length and 20 mm diameter is subjected to an axial tensile force of 20 kN. The rod undergoes elongation of 2 mm and decrease in diameter of 0.008 mm. Calculate the values of elastic constants E, G, K, μ. [6]

(*c*) At a point in a strained material the principal stresses are 120 MPa(*t*) and 60 MPa(*t*). Find the normal, tangential, and resultant stress intensities on an oblique section inclined at 30° with the major principal plane direction. [6]

3. (*a*) A rectangular cross-section bar having 2 m length, 20 mm width, and 10 mm thickness carries axial pull of 20 kN. Calculate :

(*i*) Longitudinal strain

(*ii*) Lateral strain

(*iii*) Change in length, width, thickness and volume of the bar

(*iv*) Elastic modulii G&K if $E = 2 \times 10^5$ MPa, $\mu = 0.28$. [8]

(*b*) At a point in a strained material, there exist a biaxial stress condition :

σ_x = 300 MPa(*t*), σ_y = 200 MPa(*c*), τ = 100 MPa.

Calculate :

(*i*) Principal stresses σ_{max} and σ_{min}

(*ii*) Maximum shear stress τ_{max}

(*iii*) Angle made by the major principal plane with σ_x-plane. [8]

Or

4. (*a*)

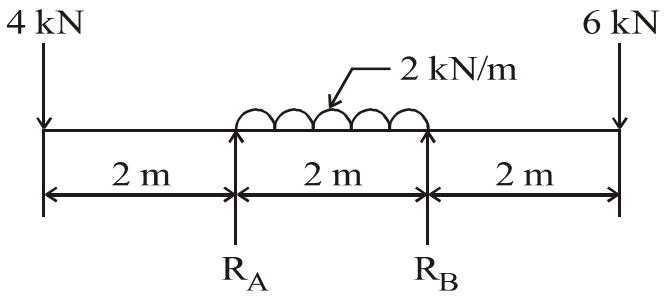


Fig. 1

For the beam shown in Fig. 1 :

(*i*) Calculate support reactions R_A, R_B.

(*ii*) Calculate shear force, and bending moment values at key-points on the beam.

(*iii*) Sketch shear force and bending moment diagrams.

(*iv*) Calculate maximum bending moment and its position.

(*v*) Find the position of point of contraflexure (if any). [8]

(*b*) A cantilever beam has 3 m length and circular cross-section with 80 mm diameter. It carries point load of 30 kN at free end. Calculate :

(*i*) Maximum bending moment

(*ii*) M.I. about the N.A.

(*iii*) Bending stress in the fibre at 30 mm from N.A.

(*iv*) Maximum bending stress in tension and compression with their positions. [8]

5. (*a*) A cylindrical shaft made of steel is required transmit 20 kW power at 300 rpm. It is subjected to bending moment of 1 kN-m. Calculate :

(*i*) Average torque transmitted by the shaft.

(*ii*) Maximum torque transmitted which is 30% higher than the average torque.

(*iii*) Equivalent bending moment (M_e) and equivalent twisting moment (T_e).

(*iv*) Shaft diameter based on M_e and T_e if the permissible stresses in tension and shear are 80 MPa and 50 MPa respectively. [8]

(*b*) A cylindrical shaft is required to transmit 30 kW power at 300 rpm :

(*i*) Calculate shaft diameter based on shear strength of the shaft.

(*ii*) Calculate shaft diameter based on torsional rigidity if maximum permissible twist is 1° per unit length of the shaft.

(Take f_s = 40 MPa, G = 80 GPa) [8]

Or

6. (*a*) A solid shaft has to transmit 40 kW power at 400 rpm. Calculate :

(*i*) Average and maximum torque transmitted by the shaft.

(*ii*) Minimum shaft diameter required if limiting shear stress is 200 MPa with F.S. = 4.

(*iii*) If solid shaft is to be replaced by a hollow shaft made of same material, calculate the outer diameter, inner diameter, thickness of the shaft.

(*iv*) Percent saving in material of the shaft (if any). [8]

(*b*) A line shaft is driven by an electric motor to transmit 100 kW power at 300 rpm. A pulley of 1 m diameter is mounted on the shaft at 400 mm from the bearing. A belt runs over the pulleys on electric motor and on the shaft. The ratio of tensions on tight and slack sides of the belt is 2 : 1. Calculate :

(*i*) Average and maximum tension in the belt.

(*ii*) Tensions on tight and slack sides of the belt.

(*iii*) Bending moment acting on the shaft due to belt tensions.

(*iv*) Shaft diameter based on equivalent bending moment if limiting tensile stress in the material of shaft is 80 MPa. [8]

SECTION II

7. (*a*) A muff coupling is used to connect two shafts transmitting 40 kW power at 400 rpm shaft and key are made of same material having limiting shear and crushing stress intensities 40 MPa and 80 MPa respectively; while the coupling is made of cast iron having limiting shear strength of 15 MPa. Calculate :

(*i*) Maximum and average torque transmitted by shaft.

(*ii*) Minimum shaft diameter based on torsional strength of the shaft.

(*iii*) The outside diameter and length of the muff (sleeve) using standard proportions.

(*iv*) Shear stress induced in the muff. (Comment on safety of the muff under shear.) [8]

(*b*) For the shaft and coupling designed in Q. **7(*a*)** calculate :

(*i*) Dimensions of rectangular sunk key using standard proportions.

(*ii*) Shear and crushing stress induced in the key. (Comment on safety of key in shear and crushing.) [8]

Or

8. (*a*) With neat sketches explain the following types of flat belt drives :

(*i*) Quarter turn drive

(*ii*) Compound belt drive

(*iii*) Cone Pulley drive

(*iv*) Fast and loose pulley drive. [8]

(*b*) A 400 mm diameter pulley is mounted on Shaft 'A' rotating at 200 rpm. Power is transmitted to a pulley 200 mm in diameter mounted on Shaft 'B' at 2 m apart from Shaft 'A'. Calculate :

(*i*) Ratio of tensions on tight and slack sides of the belt if $\theta = 180°$, $\mu = 0.3$.

(*ii*) Linear speed of the belt

(*iii*) Power transmitted

(*iv*) Length of cross-belt drive used between the pulleys mounted on shafts 'A' and 'B'. [8]

9. (*a*) Explain function of bearings and classify them on nature of contact between surfaces. [8]

(*b*) The ball bearings are to be used for an application in which the radial load is 2 kN for 80% of time and 3 kN for remaining 20% of time. The shaft rotates at 150 rpm. Calculate :

(*i*) Equivalent radial load on bearing.

(*ii*) Rating life if bearing runs for 5000 hours of operation with not more than 10% failures.

(*iii*) Dynamic load rating. [8]

Or

10. (*a*) A double row angular contact ball bearings is used for compressor, which carries radial load of 2 kN and axial thrust of 1.5 kN. Determine rating life of bearing with the following data :

$X = 1$, $Y = 0$, $V = 1$, $K_s = 1.5$, $C = 41.5$. [8]

(*b*) State the desirable properties of lubricants used for bearings. Also state different types of lubricants used for bearings. [8]

11. Write short notes on the following : [18]

(*a*) Pipe joints

(*b*) Welded joints

(*c*) Types of values.

Or

12. Write short notes on the following : [18]

(*a*) Classification of pumps

(*b*) NPSH and Cavitation in Pumps

(*c*) Control valve characteristics.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-180

S.E. (Chemical) (II Sem.) EXAMINATION, 2015

MECHANICAL OPERATIONS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Your answers will be valued as a whole.

(*vi*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vii*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain the factors affecting size of product in a ball mill. [4]

(*b*) Differentiate between open circuit grinding and closed circuit grinding. [4]

P.T.O.

(*c*) A ball mill, 1.2 m in diameter, is run at 0.80 Hz and it is found that the mill is not working properly. Should any modification in the conditions of operation be suggested ? [10]

Or

2. (*a*) Explain the importance of screening in chemical industry. [4]

(*b*) Explain open circuit grinding and closed circuit grinding with suitable flow sheets. [6]

(*c*) How is the screen analysis performed on standard screen series ? Explain in detail. [8]

3. (*a*) Explain with a neat sketch construction of screw conveyor and its advantages and disadvantages. [8]

(*b*) Describe with neat sketch the construction of Bucket elevators. [8]

Or

4. (*a*) Describe with neat sketch construction of flight conveyors. [6]

(*b*) State the advantages and limitations of pneumatic conveyors. [6]

(*c*) Differentiate between crushing and grinding. [4]

5. (*a*) Describe the types of mixers for pastes and plastic mass. [8]

(*b*) With the help of neat sketch distinguish between radial flow and axial flow impellers. [8]

Or

6. (*a*) Write short notes on : [8]

(*i*) Mixing and agitation

(*ii*) Kneaders.

(*b*) Describe with neat sketches "Prevention of swirling and vortex formation". [8]

SECTION II

7. (*a*) A slurry, containing 0.2 kg of solid per kilogram of water, is fed to a rotary drum filter 0.6 m long and 0.6 m diameter. The drum rotates at one revolution in 360 s and 20 per cent of the filtering surface is in contact with the slurry at any instant. If filtrate is produced at the rate of 0.125 kg/s and the cake has a voidage of 0.5, what thickness of cake is produced when filtering with a pressure difference of 65 kN/m^2 ? The density of the solids is 3000 kg/m^3. [10]

(*b*) Explain construction, working and applications of rotary drum vacuum filter. [8]

Or

8. (*a*) Explain the operating cycle of centrifuge filter. [6]

(*b*) What are filter aids ? How do they function ? [6]

(*c*) Explain constant rate filtration and constant pressure filtration. [6]

9. (*a*) Describe with neat sketches and examples : [8]

(*i*) Aggregate fluidization

(*ii*) Particulate fluidization.

(*b*) What is minimum fluidization ? Derive an expression for minimum fluidization. [8]

Or

10. (*a*) Explain spouted bed with neat sketch. [6]

(*b*) Distinguish between free settling and hindered settling. [4]

(*c*) Define fluidization. State the applications of fluidization technique. [6]

11. (*a*) Explain the principle of magnetic separation methods. [6]

(*b*) Explain tabling with neat diagram. [4]

(*c*) Explain Jigging separation technique with neat diagram. [6]

Or

12. (*a*) Explain the principle of electrostatic precipitation in gas cleaning. [6]

(*b*) Explain capacity and effectiveness of Screen. [4]

(*c*) Describe with neat sketches operation of Batch centrifuge and Continuous centrifuge. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-182

S.E. (Computer Engineering) (First Semester)

EXAMINATION, 2015

PROGRAMMING AND PROBLEM SOLVING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answer **3** questions from Section I and **3** questions from Section II.

(*iii*) Answers to the two Sections should be written in separate answer-books.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Figures to the right indicate full marks.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define the data types of the following data items. Justify your answer : [6]

(*i*) Sum of Money

(*ii*) Telephone number

(*iii*) Zip code.

P.T.O.

(*b*) Evlauate for A=5, B=3 and C=2 [6]

(*i*) F=A*C\(A+C)

(*ii*) F=3*B/A^2

(*iii*) F=(C*(B+3*A)+5*A)/C.

(*c*) Compare an algorithmic solutions and heuristic solutions. Support your answer with the suitable example. [4]

Or

2. (*a*) The railway ticket reservation system (Single Counter) is to be computerized. Prepare solution to this using the following tools : [8]

(*i*) IPO chart

(*ii*) Problem analysis chart

(*iii*) Interactivity chart

(*iv*) Algorithms.

(*b*) Define a function. Mention various categoires of functions. Explain at least *two* functions from each cateogry with suitable example. [8]

3. (*a*) What are the major types of modules ? Explain the term coupling and cohesion related to module. [6]

(*b*) What are different parameters passing methods ? Explain each method with the suitable example. [6]

(*c*) Using negative logic, write the algorithms and draw the flowcharts for the following set of conditions : [6]

R = 50 for S < = 1000

R = 100 for S = 1001 – 4000

R = 250 for S = 4001 – 8000

R = 75 for S > 8000

Or

4. (*a*) Make a decision table and draw a flowchart for the following set of conditions : [8]

Gross Income	Tax Rate
Gross < = 5000	5%
5000 – 10000	8%
10000 – 15000	10%
Gross > 15000	15%

(*b*) Explain concept of local variables and global variables with suitable example. [4]

(*c*) Explain decision tables in detail with example. [6]

5. (*a*) Design and explain an algorithm for GCD of two integers with suitable example. [8]

(*b*) Design and explain an algorithm for square root of a given number with suitable example. [8]

Or

6. (*a*) Design an algorithm that converts binary numbers to hexadecimal. [8]

(*b*) Given some integer X, compute the value X^n where n is positive integer which is greater than 1. [8]

SECTION II

7. (*a*) Write a pseudo algorithm for partition a randomly ordered array of n elements into two subsets such that elements less than equal to X are in one subset and elements are greater than X are in other subset. [8]

(*b*) Write short notes on : [8]

(*i*) Pointer technique

(*ii*) Table look up technique.

Or

8. (*a*) Write an algorithm for searching a number in an array using binary search technique. [8]

(*b*) Write a pseudo algorithm to find the sum of rows, sum of columns, and sum of major diagonal of a square matrix N*N. Explain with suitable example [8]

9. (*a*) Write a pseudo algorithm for text length adjustment. Explain it. [4]

(*b*) Write and explain an algorithm for left and right justification for text. [6]

(*c*) Explain algorithm for line editing. [6]

Or

10. (*a*) Write pseudo algorithm for linear pattern search. [8]

(*b*) Explain the following algorithm : [8]

(*i*) Count number of spaces on each line for given text.

(*ii*) Search keyword from given text.

11. (*a*) What do you mean by polymorphism ? Explain with suitable example. [6]

(*b*) Explain visibility modes in C++. [4]

(*c*) Explain multiple inheritance. Elaborate your answer with suitable example. [4]

(*d*) What is the advantage of encapsulation in object oriented program ? Explain with a suitable example. [4]

Or

12. (*a*) Compare procedural language and object oriented language for solving problems. What are their advantages and disadvantages ? [8]

(*b*) Explain concept of inheritance. What are the different types of inheritance supported in C++ ? [4]

(*c*) Define a class Bank Account having data members : [6]

(*i*) Name of the depositor

(*ii*) Account number

(*iii*) Type of account

(*iv*) Balance amount in the account.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-183

S.E. (Computer/IT) (First Semester) EXAMINATION, 2015
DIGITAL ELECTRONICS AND LOGIC DESIGN
(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Answer any *three* questions from each Section.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Convert the following decimal numbers into their equivalent binary, hexadecimal and octal numbers : [12]

(*i*) 936

(*ii*) 1507

(*iii*) 23.56

(*iv*) 1.025.

(*b*) Perform the following operations without converting the numbers to decimal : [6]

(*i*) $(1011)_2 \times (101)_2$

(*ii*) $(1000001)_2 \div (1101)_2$

P.T.O.

Or

2. (*a*) Express the following numbers in binary format. Write step by step solution : [6]

(*i*) $(762)_{\text{octal}}$

(*ii*) $(246)_{\text{decimal}}$

(*iii*) $(1101.11)_{\text{decimal}}$.

(*b*) Solve the following equations using corresponding minimization techniques : [12]

(*i*) $Z = f(A, B, C, D) = \pi(2, 7, 8, 10, 11, 13, 15)$

(*ii*) $Z = f(A, B, C, D) = \Sigma(0, 3, 4, 9, 10, 12, 14)$.

3. (*a*) Solve by Quine-McClusky technique : [10]

$Z = f(A, B, C, D) = \Sigma(0, 1, 3, 4, 6, 8, 10, 12, 14)$.

(*b*) Explain standard TTL characteristics in brief. [6]

Or

4. (*a*) Draw 2-i/p standard TTL NAND gate with Totem Pole. Explain operation of transistor (ON/OFF) with suitable input conditions and truth table. [8]

(*b*) Compare TTL and CMOS logic family (any 4 points). Also draw CMOS-NOR gate. [8]

5. (*a*) Design and implement 4-bit binary to gray code converter using basic gates. [8]

(*b*) Draw 4-bit BCD Adder by using IC 7483 and logic gates. [8]

Or

6. (*a*) Design 12 : 1 mux using 4 : 1 multiplexers (with enable inputs). Explain the truth table of your circuit in short. [8]

(*b*) Implement the following function using 4 : 1 MUX and logic gates : [8]

$$F(A, B, C, D) = \Sigma(0, 2, 5, 8, 10, 15).$$

SECTION II

7. (*a*) What is MOD counter ? Explain MOD-27 counter using IC 7490. Draw design for the same. [8]

(*b*) What is the difference between Asynchronous and Synchronous Counter ? Draw a 3-bit Asynchronous counter. Explain timing diagram for the same. [10]

Or

8. (*a*) Explain the difference between combinational and sequential circuit. Also convert J-K flip-flop into D-F/F and T-F/F. Show the Truth Table. [10]

(*b*) Give any *four* applications of Shift Registers. Also explain 4-Bit Johnson's Counter. [8]

9. (*a*) What is ASM chart ? Give its application and explain the MUX controller method with the suitable example. [8]

(*b*) What is VHDL ? Explain entity architecture declaration for 2-Bit X-NOR gate. [8]

Or

10. A sequential circuit has to count up from 111 to 000. The ckt also has i/p X. If X = 0, then circuit will count DOWN and if X = 1, then they will remain in the current state. Draw an ASM chart and state table for this circuit and design the circuit to generate the o/p using MUX controller method. [16]

11. (*a*) Explain basic characteristics of FPGA. [8]

(*b*) What is the difference between CPLD and FPGA. [8]

Or

12. (*a*) Explain in brief, the working of Address bus, Data bus and Control bus by assuming a basic operation. [8]

(*b*) Explain basic microprocessor architecture. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-184

S.E. (Computer) (I Sem.) EXAMINATION, 2015
DATA STRUCTURES AND ALGORITHM
(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What is recursion ? Explain with example. What are its advantages and disadvantages ? [8]

(*b*) Explain with example primitive functions for file handling in C. [10]

Or

2. (*a*) Suppose you are given an array s[1....n] and a procedure reverse (s, i, j) which reverses the order of elements in a between positions i and j (both inclusive). What will be the output of the following sequence of stamen if s[100011]. Show step by step change in s. [4]

```
1.   while (1 < k <= n)
1.1  reverse (s, 1, k);
1.2  reverse (s, k + 1, n);
1.3  reverse (s, 1, n);
```

P.T.O.

(*b*) Write a recursive function for the following and show step by step function cal f(5) :

$f(n) = n$ if $n = 0, 1$

$= f(n - 1) + f(n - 2)$ otherwise. [8]

(*c*) Explain pass by value and pass by reference parameter passing to function with example. [6]

3. (*a*) State whether it is correct or incorrect. Justify your answer.

(1) $10n^2 + 9 = O(n)$

(2) $n! = O(n^n)$

(3) $3n + 6 = O(n)$. [6]

(*b*) What is the frequency count of the following :

```
float sum(int a[10], int n)
{
int s = 0;
for(int i = 1; i <= n; i++)
        s += a[i];
return(s);
}
```

Find out time complexity. [5]

(*c*) Write 'C' functions to display transpose of a matrix. What is its time complexity ? [5]

Or

4. (*a*) Write an algorithm for multiplication of two matrices and find out its time complexity and space complexity. [10]

(*b*) Explain asymptotic notation. [6]

5. (*a*) Write an ADT for sparse matrix. Write an algorithm for sparse matrix addition. [10]

(*b*) What is column major and row major representation methods of an array ? Derive the address calculation formula for both methods. [6]

Or

6. (*a*) What is sparse matrix ? Write an algorithm to find simple transpose of sparse matrix. Compare fast transpose and simple transpose method. [10]

(*b*) Write an ADT for polynomial. Write algorithm for polynomial evaluation. [6]

SECTION II

7. (*a*) Sort the following numbers step by step by using quick sort : Also comment on time complexity of quick sort in best case worst case and average case :

5, 3, 8, 9, 12, 7, 10, 2, –6, 1. [10]

(*b*) Write an algorithm for shell sort. [6]

Or

8. (*a*) Write and explain with an example algorithm for radix sort. What is time complexity of radix sort ? [6]

(*b*) Write an algorithm for Binary Search. Explain its best case, worst case and average case complexity with example. [10]

9. (*a*) Write pseudo code to reverse singly linked lists of string data. Analyze time complexity of this code. [8]

(*b*) Write a node structure for Generalized linked list. Show graphical representation for the following GLL : [8]

(a, b, (d, (e, f), g, (h, l), m)).

Or

10. (*a*) Write and explain a node structure to represent polynomial using GLL. What are the advantages of using GLL for polynomial representation ? [8]

(*b*) Write a function to perform addition of two polynomial using circular linked list. Explain time complexity of it. [8]

11. Write short notes on :

(1) Stack application

(2) Josephus problem

(3) Double ended queue and its primitive operations. [18]

Or

12. (*a*) Write an algorithm to convert prefix expression to infix expression. Comment on its time complexity. [8]

(*b*) Convert the following infix expression to postfix expression and evaluate the postfix expression with the following values : [10]

(a + (b * c)/e ^ f – (g * h))

A = 10, b = c = 4, e = 2, f = 3, g = 1, h = 5.

Total No. of Questions—**6**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-185

S.E. (Comp./IT) (First Semester) EXAMINATION, 2015
HUMANITIES AND SOCIAL SCIENCES
(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

SECTION I

1. (*a*) India is a land of diversified culture. Discuss. [6]

(*b*) Explain in brief : [10]

(*i*) Panchayat Raj for Rural Development.

(*ii*) Structure of Indian Society.

Or

(*a*) Explain the institutions of marriage and types of families with their salient features. [10]

(*b*) Explain in brief importance of Sociology. [6]

P.T.O.

2. (*a*) Differentiate between Social Change and Social Progress. [8]

(*b*) Explain the social impact of Industrial Development in brief. [8]

Or

(*a*) India needs to improve upon Health Sector. Comment. [8]

(*b*) Explain the salient features of Policy on National Education in brief. [8]

3. (*a*) Technology can change the Indian Agriculture Sector to increase Production sector. Explain. [9]

(*b*) India is a land of greater opportunities for investments in infrastructure. Explain. [9]

Or

Write short notes on the following : [18]

(*i*) Private Sector in India for Economic Development

(*ii*) Green Revolutions in India

(*iii*) Consumer Awareness.

SECTION II

4. Explain in brief :

(*i*) Energy Resources in India [5]

(*ii*) Global Population Growth [5]

(*iii*) Air Pollution. [6]

Or

(*i*) Loss of Bio-Diversity [5]

(*ii*) Components of Ecosystems [5]

(*iii*) Global Warming. [6]

5. (*a*) Explain the Law of Demand and Supply. [8]

(*b*) Explain the need for Planned Economic Development of India. [8]

Or

(*a*) Discuss the priorities and problems in the Five Year plans. [8]

(*b*) Discuss the challenges faced by Indian Economy. [8]

6. Write short notes on the following : [18]

(*i*) Reserve Bank of India

(*ii*) Budget Analysis

(*iii*) International Economy.

Or

(*i*) Financial Institutions of India

(*ii*) Ration Analysis

(*iii*) Cost Analysis.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-186

S.E. (Computer) (Second Semester) EXAMINATION, 2015

DATA STRUCTURES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Write a pseudo code c/c++ to delete a node from binary search tree. [6]

(*b*) Explain binary tree traversal, with suitable example. [6]

(*c*) Explain *three* applications of binary tree. [6]

Or

2. (*a*) Explain Huffman's code with suitable example. [6]

(*b*) Write an ADT for BST. [4]

(*c*) Write the pseudo c/c++ code of inorder threaded binary tree. [8]

P.T.O.

3. (*a*) What are graph storage structures ? [4]

(*b*) Explain the graph traversal techniques with suitable example. [8]

(*c*) What is minimum spanning tree ? Write *three* applications of this. [4]

Or

4. (*a*) Explain topological sorting with suitable example. [8]

(*b*) Write step-by-step solution using Kruskal's algorithm for finding out minimum spanning tree of the given graph. [8]

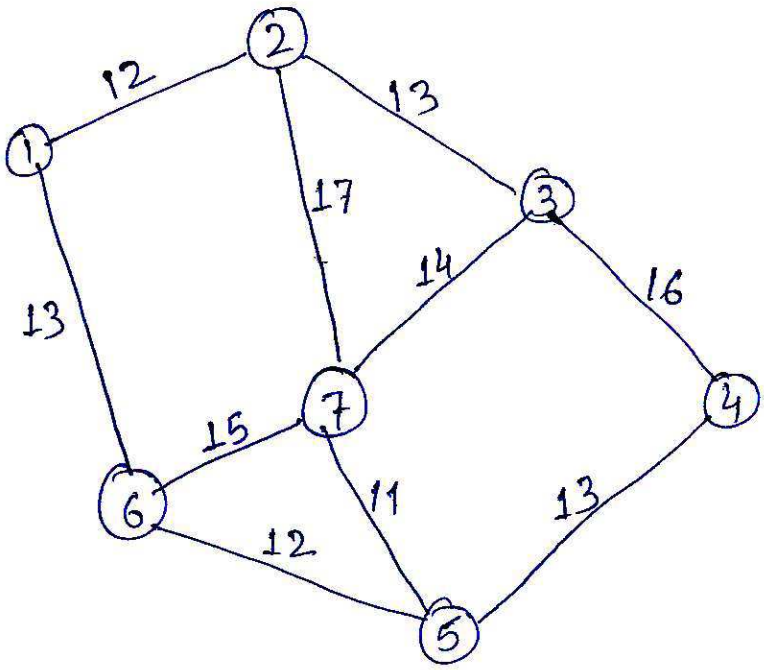


Fig. : Given Graph for Finding MST.

5. (*a*) What is AVL tree ? Explain, what are its transformation. [8]

(*b*) What is hash function ? What are characteristics of a good hash function ? Explain any *two* hash functions with suitable example. [8]

Or

6. (*a*) What is collision ? Explain any *one* collision resolution technique with suitable example. [8]

(*b*) Create an AVL tree for the following data : [8]

30, 31, 32, 23, 22, 28, 24, 29, 26, 27, 34, 36.

SECTION II

7. (*a*) What is heap ? Explain max and min heap and write its any *two* applications. [8]

(*b*) Explain the steps to be build a tree of order 5 for the following data : [10]

78, 21, 14, 11, 97, 85, 74, 63, 45,
42, 57, 20, 16, 19, 32, 30, 31.

Or

8. (*a*) Sort the following data in ascending order using heap sort : [8]

6, 5, 3, 1, 8, 7, 2, 4.

(*b*) Write a pseudo code c/c++ to insert the node in B-tree. Explain with suitable example. [10]

9. (*a*) What is directed file organisation ? Write its *two* advantages and *two* disadvantages. [8]

(*b*) What are *four* differences in between sequential and random access file ? [8]

Or

10. (*a*) What are external storage devices ? Explain in brief any *four*. [8]

(*b*) What are different types of indices ? [4]

(*c*) What is file ? Explain the types of file. [4]

11. (*a*) Explain the following terms : [2×4=8]

(*i*) ADT

(*ii*) Classes and Objects

(*iii*) Generic Programming

(*iv*) Template class.

(*b*) What is iterator and container ? Explain different types of iterators in brief. [8]

Or

12. (*a*) Write a program in c/c++ to implement stack using STL. [8]

(*b*) Write the implementation of queue using list in STL : [8]

(*i*) Insertion of an element

(*ii*) Deletion of an element.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-187

S.E. (Computer) (Second Semester) EXAMINATION, 2015

MICROPROCESSORS AND INTERFACING TECHNIQUES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain with neat diagram memory segmentation in 8086 microprocessor. [8]

(*b*) Explain the following 8086 signals : [4]

(*i*) INTR

(*ii*) DT/R

P.T.O.

(*iii*) TEST

(*iv*) ALE.

(*c*) Draw and explain the flag resister of 8086 microprocessor. [4]

Or

2. (*a*) Draw and explain the Read cycle timing diagram of 8086 in maximum mode. [6]

(*b*) State the difference between memory mapped I/O and I/O mapped I/O. [4]

(*c*) Draw block diagram of 8086 microprocessor and explain Execution Unit (EU). [6]

3. (*a*) Explain the following adressing modes : [8]

(*i*) Register Addressing Mode

(*ii*) Based Index Addressing Mode

(*iii*) Register Relative Addressing

(*iv*) Relative Based Index Addressing.

(*b*) Explain with the example following instructions for 8086 : [8]

(*i*) XCHG

(*ii*) XLAT

(*iii*) MUL

(*iv*) LEA.

Or

4. (*a*) Explain PUBLIC and EXTERN assembler directives with the help of suitable example. [4]

(*b*) Differentiate between the following : [8]

(*i*) Macro and procedure with examples

(*ii*) Near and Far Procedure.

(*c*) Explain the following instructions of 8086 Microprocessor with example : [4]

(*i*) ROR

(*ii*) CLC.

5. (*a*) Draw and explain Block diagram of 8259 PIC. [8]

(*b*) What does the CPU do when it receives an interrupt ? [6]

(*c*) What is the difference between DOS and BIOS calls ? [4]

Or

6. (*a*) What are the components of MS-DOS ? Explain the steps by which MS-DOS is loaded after power on. [10]

(*b*) Draw and explain the structure of program segment prefix clearly indicate offsets in the structure. [8]

SECTION II

7. (*a*) Draw and explain the functional internal block diagram of 8255. What is the use of the IC ? [8]

(*b*) What is D/A converter ? Which are different methods for D/A conversion ? Explain R2R ladder DAC with block diagram. [8]

Or

8. (*a*) With the help of block diagram explain various modes of operations of 8255. [8]

(*b*) Define the following terms for D/A converters : [8]

(*i*) Resolution

(*ii*) Accuracy

(*iii*) Monotonicity

(*iv*) Conversion time.

9. (*a*) Draw and explain the complete interface diagram between 8086 and 8279 keyboard/display controller with 4×4 keyboard matrix. Also write the instructions in 8086 assembly to initialize 8279. [8]

(*b*) Draw the interfacing diagram of 8254 with 8086. [8]

Or

10. (*a*) Explain the following modes of operation for DMA in detail : [6]

(*i*) Single transfer

(*ii*) Block transfer

(*iii*) Demand transfer mode.

(*b*) Explain control word format of 8254. [5]

(*c*) What is DMA ? Explain the mechanism by which 8237 DMA controller is used for data transfer in DMA operation. [5]

11. (*a*) Draw the 8086 maximum mode system configuration. Give the necessity of each chip used in the system. [10]

(*b*) Explain the following instructions of NDP : [8]

(*i*) FMUL

(*ii*) FSTP

(*iii*) FILD

(*iv*) FISUB.

Or

12. (*a*) Explain concept of stack in 8087 NDP with suitable diagram. [8]

(*b*) Explain the following instructions of NDP : [10]

(*i*) FXCH

(*ii*) FADDP

(*iii*) FSQRT

(*iv*) FABS

(*v*) FIST.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-188

S.E. (Computer) (Second Semester) EXAMINATION, 2015

COMPUTER GRAPHICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right side indicate full marks.

SECTION I

1. (*a*) Explain Bresenham's circle drawing algorithm with mathematical derivation. [10]

(*b*) Explain Random scan display. [4]

(*c*) What is aliasing and antialiasing ? [4]

P.T.O.

Or

2. (*a*) Explain Bresenham's line drawing algorithm with illustration. [8]

(*b*) Explain the features of the following : [6]

(*i*) mouse

(*ii*) joystick

(*iii*) light pen

(*c*) Explain Stroke method and Bitmap method of character generation. [4]

3. (*a*) What are the different methods for testing pixels inside and outside the polygons ? [8]

(*b*) Explain Sutherland Hodgeman polygon clipping algorithm with example. [8]

Or

4. (*a*) What is the need for clipping ? Explain Cohen-Sutherland outcode algorithm. [8]

(*b*) Explain any *two* polygon filling algorithms. [8]

5. (*a*) Explain parallel projection and its types. [8]

(*b*) Write a short note on 2-D rotation and 2-D shear transforms. [8]

Or

6. (*a*) Find the transformation matrix of the triangle A(1, 0), B(0, 1), C(1, 1) by rotating 45° about the origin and then translate 1 unit in *x* direction and 1 unit in *y* direction. [8]

(*b*) Write the transformation matrix in 3-D for : [8]

(*i*) Translation

(*ii*) Scaling

(*iii*) Rotation about *x*-axis

(*iv*) Rotation about *z*-axis.

SECTION II

7. (*a*) Write the algorithm for the following : [8]

(*i*) Change of visibility attribute of segments

(*ii*) Delete a segment

(*iii*) Delete all segments.

(*b*) Compare conventional and computer based animation. [8]

Or

8. (*a*) What are the advantages of using segmented display file ? Explain with examples the functions needed to maintain a segmented display file. [8]

(*b*) Explain in brief the basic guidelines of animation. [8]

9. (*a*) Explain Painter's algorithm. [8]

(*b*) Describe : [8]

(*i*) Diffused illumination

(*ii*) Point source illumination.

Or

10. (*a*) Explain Warnock's algorithm. [8]

(*b*) Write a short note on Ray-Tracing. [8]

11. Write short notes on any *three* of the following : [18]

(*i*) Properties of Bezier curve

(*ii*) Fractal geometry

(*iii*) True curve generation

(*iv*) Interpolating algorithm.

Or

12. Write short notes on any *three* of the following : [18]

(*i*) B-spline curve

(*ii*) Blending functions

(*iii*) Fractal lines and surfaces

(*iv*) Koch curve.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-189

S.E. (Computer Engineering) (Second Semester)

EXAMINATION, 2015

COMPUTER ORGANIZATION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I.

(*ii*) Answer Q. No. **7** *or* Q. No. **8,** Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*iii*) Neat diagram must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw the hardware implementation of booth's algorithms and explain the same. [8]

(*b*) Show the general structure of IAS computer. Explain stored program concept. [6]

(*c*) Write neat diagram, explain in detail functional units of computer system. [4]

P.T.O.

Or

2. (*a*) Perform the following divisions using restoring division : [8]

(*i*) Dividend = 1011

(*ii*) Divisor = 11.

(*b*) Draw and explain the flowchart for floating point addition and explain. [6]

(*c*) Draw and explain Von Neumann architecture. [4]

3. (*a*) Draw and explain CPU architecture of Intel processor. [8]

(*b*) Discuss in detail register organization of intel processor. [8]

Or

4. (*a*) List and explain different addressing modes of Pentium processor. [8]

(*b*) Explain in detail horizontal and vertical organization of microinstructions. [8]

5. (*a*) What are the different design methods for hardwired control units ? Explain any *one*. [8]

(*b*) Explain the design of ALU using combinational circuits. [8]

Or

6. (*a*) Draw and explain single bus organization of CPU. [8]

(*b*) Explain instruction cycle. How will you represent instruction cycle with interrupts ? Explain. [8]

SECTION II

7. (*a*) What is virtual memory concept ? Explain the role of TLB in virtual memory organization. [10]

(*b*) Explain the following : [8]

(*i*) RAID

(*ii*) Magnetic Memory.

Or

8. (*a*) Explain cache coherence strategies. [8]

(*b*) Explain the following : [10]

(*i*) DAT

(*ii*) DRAM.

9. (*a*) Explain Synchronous and Asynchronous bus in an input operation with timing diagrams. [8]

(*b*) Explain Programmed I/O and Interrupt Driven I/O. [8]

Or

10. (*a*) Explain in detail DMA data transfer mode. [8]

(*b*) Explain in detail how scheduling and memory management is done by operating system with its types. [8]

11. (*a*) Explain in detail super scalar architecture. [8]

(*b*) Explain Symmetric multiprocessor organization. [8]

Or

12. (*a*) Enlist the characteristics of Non-Uniform Memory Access (NUMA). [8]

(*b*) Compare RISC versus CISC. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+1**

Seat No.	

[4757]-190

S.E. (I Sem.) EXAMINATION, 2015

(Common to Computer Engineering and IT)

DISCRETE STRUCTURES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) In Section I attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**.

(*iii*) In Section II attempt Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Figures to the right indicate full marks.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Determine whether each of the following statements is true or false. Briefly explain your answer : [8]

(*i*) $A \cup P(A) = P(A)$

(*ii*) $\{A\} \cup P(A) = P(A)$

(*iii*) $\{A\} \cap P(A) = A$

(*iv*) $A - P(A) = A$.

P.T.O.

(*b*) Obtain the conjunctive normal form of : [8]

(*i*) $(\sim p \rightarrow r) \wedge (p \leftrightarrow q)$

(*ii*) $(p \wedge q) \vee (\sim p \wedge q \wedge r)$.

Or

2. (*a*) Give truth table and comment whether tautology or contradiction : [8]

(*i*) $\neg(\neg P \vee \neg Q)$

(*ii*) $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \vee R)$

(*iii*) $(P \rightarrow Q) \wedge (Q \rightarrow P)$.

(*b*) To describe various restaurants in the city, we let p denotes the statement "The food is good", q denotes the statement "The service is good", r denotes the statement "The rating is three-star". Write the following statement is symbolic form : [6]

(*i*) Either the food is good or the service is good or both.

(*ii*) Either the food is good or the service is good but not both.

(*iii*) The food is good while the service is poor.

(*iv*) It is not the case that both the food is good and the rating is three-star.

(*v*) If both the food and services are good, then the rating will be three-star.

(*vi*) It is not true that a three-star rating always means good food and good service.

(*c*) Define the term countably infinite set and uncountably infinite set. [2]

3. (*a*) Define with examples : [8]

(*i*) Subgroup

(*ii*) Cyclic Group

(*iii*) Field

(*iv*) Integral domain.

(*b*) Prove the following results for the group G : [6]

(*i*) The identity element is unique.

(*ii*) Each a in G has a unique inverse a^{-1}.

(*iii*) $ab = ac$ implies $b = c$.

(*c*) What is homomorphism and automorphism in an algebraic system ? [2]

Or

4. (*a*) A central groupoid is an algebraic system (A, *), where * is a binary operation such that $(a * b) * (b * c) = b$. For all a, b, c belongs to A. Such that : [8]

(*i*) $a * ((a * b) * c) = a * b$

(*ii*) $(a * (b * c)) * c = b * c$.

(*b*) Let Z = {0, 1, 2, ..., $n - 1$}. Let $\Diamond$ be a binary operation such that $a \Diamond b$ = remainder of $a.b$ divided by n. Construct a table of $n = 4$. Is $(Z_4, \Diamond)$ a groupoid, monoid, semi-group and abelian group. [8]

5. (*a*) Let R be a binary relation on the set of all strings of 0's and 1's such that R = {(*a, b*) | *a* and *b* are strings that have the same number of 0's} : [8]

(*i*) Is R reflexive ?

(*ii*) Is R symmetric ?

(*iii*) Is R antisymmetric ?

(*iv*) Is R transitive ?

(*v*) Is R equivalence relation ?

(*vi*) Is R a partial ordering relation ?

(*b*) Find the transitive closure of R by Warshall's algorithm : A = {set of integers <=10}, B = {(*a, b*) | *a* divides *b*}. [8]

(*c*) Let X = {1, 2, 3} and *f* and *g*, be function from X to X given by : [2]

f = {(1, 2), (2, 3), (3, 1)}, *g* = {(1, 2), (2, 1), (3, 3)}.

Find :

(*i*) *f* o *g*

(*ii*) *g* o *f*.

Or

6. (*a*) For a given set A consider R = {(*x, y*) | *x* ∈ P(A), *y* ∈ P(A), *x* Ì *y*}. Show that R is a partial ordering relation. What is the length of the longest chain in the poset {P(A), R} ? [8]

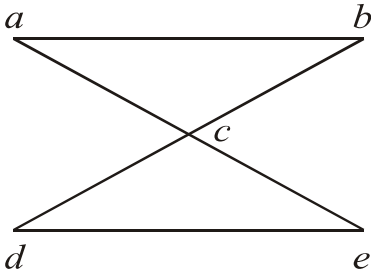
(*b*) Let A = {1, 2, 3, 4, 6, 12, 16, 36} and let R be the relation on A defined by *x* divides *y*. Draw the Hasse diagram. Compare it with digraph. Determine whether R is a reflexive, transitive and symmetric. [8]

(*c*) Let A = {2, 3, 4, 6} and let *a*R*b* if *a* divides *b*. State R is a partial order. [2]

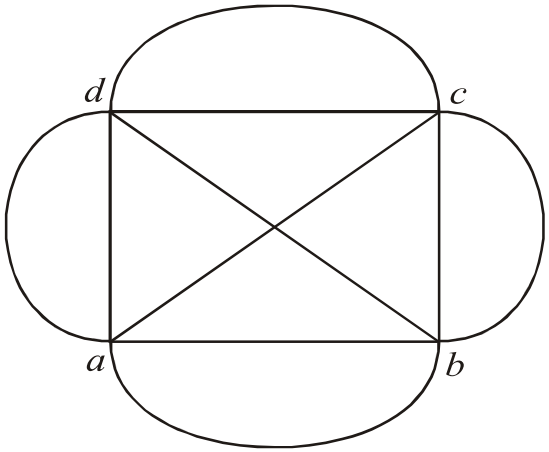
SECTION II

7. (*a*) Which of the following graphs have a Euler circuit or path or Hamiltonian cycle ? Write the path or circuit : [6]

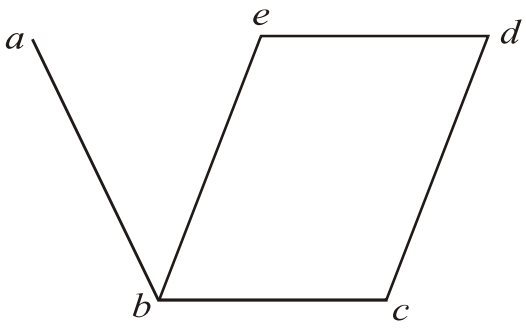
(*i*)



(*ii*)



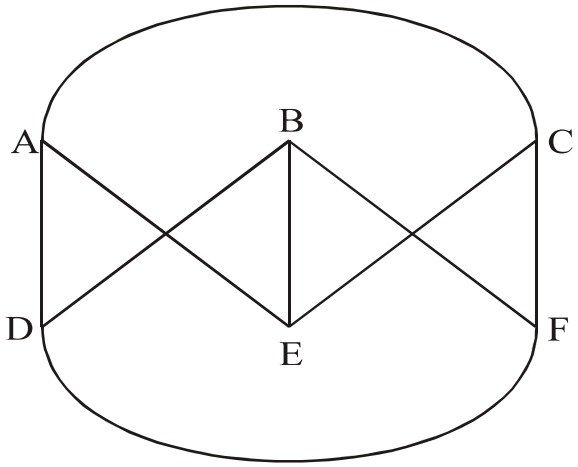
(*iii*)



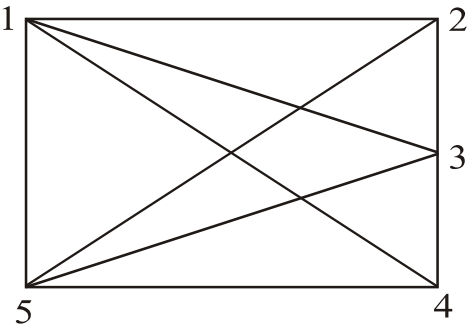
(*b*) Define graph and multigraph. Give any *two* applications of graph and represent them in graph notation. [6]

(*c*) Identify whether the graphs given are planar or not. Draw planar representation if possible : [6]

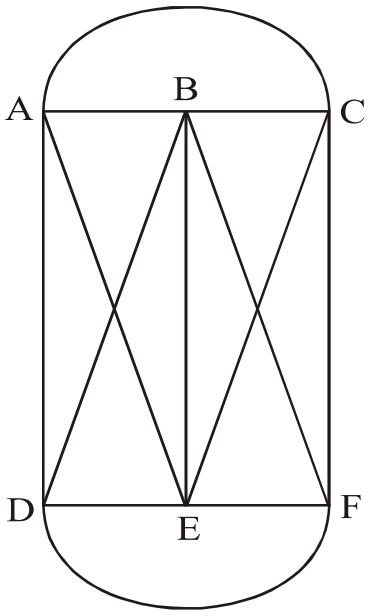
(*i*)



(*ii*)



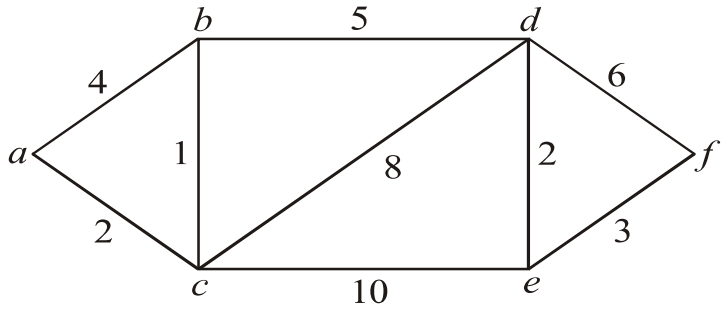
(*iii*)



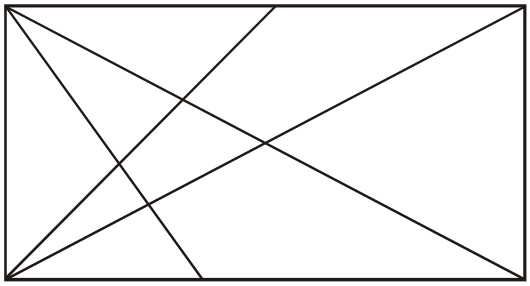
Or

8. (*a*) State and prove Euler's formula for a connected planar graph of order n, size e and with f faces. [6]

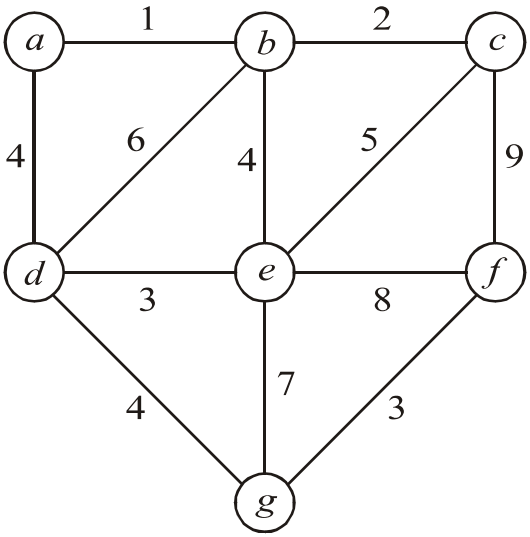
(*b*) Use Dijkstra algorithm to find the shortest path from a to f. [8]



(*c*) Draw isomorphic graph of a graph shown in the following figure but no crossover of edges. [4]



9. (*a*) Using Prim's algorithm construct minimal spanning tree starting at vertex a. [6]



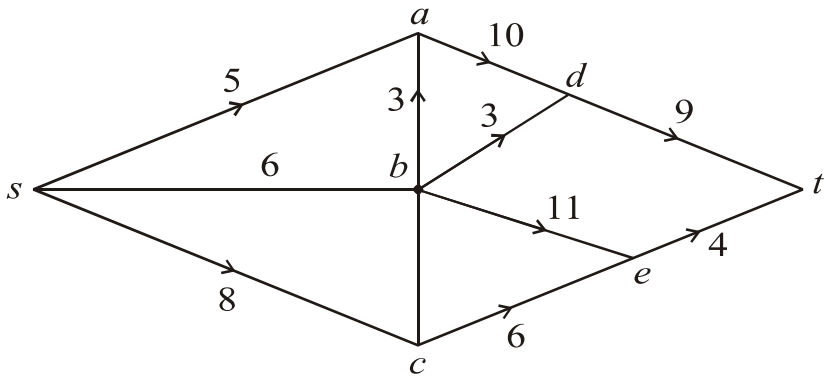
(*b*) Draw a binary search tree for input data 200, 100, 300, 50, 150, 250, 400, 10, 75, 125, 175. Which is a root, leaf nodes and interior nodes. [6]

(*c*) Construct the expression tree for the following expression : (3 – (2(–11 – (9 – 4)))) ÷ (2 + (3 + (4 + 7))).

Also evaluate expression. [4]

Or

10. (*a*) Use labeling procedure to find maximum flow in transport network shown below. Define corresponding minimal cuts. [8]



(*b*) Use Huffman coding to encode the following symbol with the frequencies listed A : 0.08, B : 0.010, C : 0.12, D : 0.15, E : 0.20, F : 0.35. What is average number of bits used to encode the character ? [8]

11. (*a*) If repetitions are not permitted, how many four digit numbers can be formed from digits 1, 2, 3, 7, 8 and 5. [6]

(*b*) Show that : [6]

$$c(2n,\ 2) = 2c(n,\ 2) + n^2.$$

(*c*) How many seven letter words can be formed using the letters of the word BENZENE ? [4]

Or

12. (*a*) Three students A, B and C are swimming in the race. A and B have same probability of winning and each is twice as likely to win as C. Find probability that : [6]

(*i*) B wins

(*ii*) C wins

(*iii*) B or C wins.

(*b*) A woman has 11 friends of them six are women : [6]

(*i*) In how many ways can she invite three or more ?

(*ii*) In how many ways can she invite three or more of them if she wants same number of men and women (including herself) ?

(*c*) A coin is tossed 3 times. Find the probability that there will appear : [4]

(*i*) Three heads

(*ii*) Exactly 2 heads

(*iii*) No heads.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-192

S.E. (IT) (First Sem.) EXAMINATION, 2015

COMPUTER ORGANIZATION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Solve Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4** and Q. No. **5** *or* Q. No. **6** from Section I and solve Q. No. **7** *or* Q. No. **8,** Q. No. **9** *or* Q. No. **10** and Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Compare Restoring and Non-restoring division algorithm. Perform the division using restoring division algorithm : [10]

Dividend = 17, Divisor = 3.

P.T.O.

(*b*) Draw IEEE standards for single precision and double precision floating point numbers. Represent $(-84.25)_{10}$ in single precision and double precision format. [8]

Or

2. (*a*) Explain Booth's algorithm for signed multiplication. Multiply the following numbers using Booth's algorithm : [10]

A = 15 multiplicand

B = – 6 multiplier.

(*b*) Draw IAS (Von Neumann) Architecture and explain function of registers in it. [8]

3. (*a*) What do you mean by programmers model of 8086 ? Explain the same with neat diagram. [8]

(*b*) Describe the following addressing modes of 8086 along with suitable examples : [8]

(*i*) Immediate

(*ii*) Register indirect

(*iii*) Autoincrement

(*iv*) Index addressing mode.

Or

4. (*a*) Draw timing diagram for memory write cycle of 8086 in Minimum Mode and list operations in each T state. [8]

(*b*) State design factors in design of Instruction format. Draw instruction format for INTEL processor and explain various fields in it. [8]

5. (*a*) Draw and explain single bus organization of the CPU, showing all the registers and data paths. [8]

(*b*) Explain design of multiplier control unit using delay element method. [8]

Or

6. (*a*) Write control sequence for execution of the instruction ADD(R1), R2 for single bus architecture. [8]

(*b*) Compare : [8]

(*i*) Horizontal and vertical microinstruction representation.

(*ii*) Hardwired and microprogammed control unit.

SECTION II

7. (*a*) Explain the following terms : [8]

(*i*) Cache updation policies

(*ii*) Cache Hit and Cache miss.

(*b*) State cache mapping techniques ? Explain any *one* with neat diagram. [10]

Or

8. (*a*) What is Virtual memory ? Explain address translation mechanism for converting virtual address into physical address with neat diagram. [10]

(*b*) Write short notes on (any *two*) : [8]

(*i*) SDRAM

(*ii*) Optical Disk

(*iii*) RAID

(*iv*) EEPROM.

9. (*a*) Compare and explain programmed I/O and Interrupt driven I/O. [8]

(*b*) Write short notes on keyboard and scanner. [8]

Or

10. (*a*) Explain functions and features of IC 8255 and 8251. [8]

(*b*) Explain the working principle of the following : [8]

(*i*) Laser Printer

(*ii*) Video displays.

11. (*a*) Draw and explain loosely coupled multiprocessor configuration with its merits. [8]

(*b*) Explain briefly : [8]

(*i*) Instruction pipelining

(*ii*) Superscalar architecture.

Or

12. (*a*) Compare the following : [8]

(*i*) RISC and CISC

(*ii*) UMA and NUMA.

(*b*) What is cluster ? What are advantages of clustering ? Explain cluster classification. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-194

S.E. (Information Technology) (First Semester)

EXAMINATION, 2015

FUNDAMENTAL OF DATA STRUCTURES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Answer any *three* questions from each Section.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What is structure in C ? Give its applications. [4]

(*b*) Compare macro and function. [4]

(*c*) Write C program to swap two nos. using call by reference. [8]

Or

2. (*a*) Write a C program to print binary equivalent of a decimal number. [6]

(*b*) Explain various operators in 'C'. [4]

P.T.O.

(*c*) Select the choice for the correct answer and write that choice : [3×2=6]

(*i*)
```
#include<stdio.h>
#define x 20
main( )
{
    int x=50;
    printf("%d\n", x);
}
```

The above code snippet will print :

(1) 20

(2) 50

(3) Compile error

(4) None of the above

(*ii*)
```
int main(void)
{
    int x=10;
    if (! x)
        printf("Hello\n");
    else
    {
        x=0
        printf("Bye\n")
    }
    return 0;
    }
```

The above code snippet will print :

(1) Bye

(2) Hello

(3) Hello (infinitely .....)

(4) Bye (infinitely .....)

3. (*a*) Write a C program to find transpose of a matrix. [6]

(*b*) Write a C program to perform multiplication of two 4 by 4 matrices using function. [6]

(*c*) Describe the following declarations : [4]

(*i*) int *p[10];

(*ii*) float (*p) (int no);

(*iii*) int (*q) [5];

(*iv*) char s[10][20][50];

Or

4. (*a*) Write a C program to find HCF and LCM of two nos. [8]

(*b*) What is recursion ? Explain with example. [4]

(*c*) Write a C program to find length of a string without using library functions. [4]

5. (*a*) What is an abstract data type ? Explain with an example. [4]

(*b*) Determine the frequency counts for all the statements in the following program segment : [6]

```
add(a, b, c, m, n)
{
    for i:=1 to m do
    for j:=1 to n do
    c[i][j]:=a[i][j]+b[i][j];
}
```

(*c*) What do you mean by frequency count of a statement ? Explain its importance in analysis of algorithm with suitable examples. [8]

Or

6. (*a*) Explain Big Oh, Omega and Theta notations used to analyze time complexity. [6]

(*b*) Write a non-recursive C function to generate Fibonacci series. [4]

(*c*) Write an algorithm to find smallest element in an array of integers and analyze is time complexity. [8]

SECTION II

7. (*a*) Explain similarities and differences between bubble and selection sort. Justify why selection sort is more efficient. [8]

(*b*) Write C program for selection sort. Analyze its time complexity. Show output after each pass for the following list : [10]

50, 15, 70, 18, 14, 30, 13, 10, 21, –15.

Or

8. (*a*) Write a C program for Merge sort and explain it using example. [8]

(*b*) Consider the following numbers. Sort them using "bubble sort". Comment on time and space complexity in best, average and worst cases. Show output after each pass : [10]

45, 33, 6, 55, 3, 0, –4, 30.

9. (*a*) Write a C program for Fast and Simple Transpose. [10]

(*b*) Represent the following polynomials using arrays : [6]

(*i*) $x^5 - 5x^3y^2 + 2y - x$

(*ii*) $2x^5 + 21x^4y^2 - 30x^2y^2 + 10x$

(*iii*) $-3x^5y^7 + 7y^3 - 2$.

Or

10. (*a*) Write a C program for performing the following string operations without using library functions : [8]

(*i*) Reverse of a string

(*ii*) Palindrome of two strings.

(*b*) Write a C program for addition of two polynomials where polynomials are represented using array. [8]

11. (*a*) Write recursive functions for the following operations on SLL : [8]

(*i*) Display reverse

(*ii*) Count no. of nodes.

(*b*) Write a C program to create doubly link list. [6]

(*c*) Write applications of linked lists. [2]

Or

12. (*a*) Write a C program to add two decreasing ordered polynomials with positive exponents, represented using circular SLL with header node exponent field is set to –1. [8]

(*b*) Compare sequential data organization with linked organization. [6]

(*c*) Why linked organization is preferred over sequential organization in list manipulation ? [2]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-196

S.E. (Information Technology) (Second Semester)

EXAMINATION, 2015

DATA STRUCTURES AND FILES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer question Nos. **1** or **2, 3** or **4** and **5** or **6** from Section I and question Nos. **7** or **8, 9** or **10** and **11** or **12** from Section II.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Assume suitable data if necessary.

SECTION I

1. (*a*) Explain various file opening modes with respect to text and binary files. [6]

(*b*) Explain the features of a sequential file. Write a 'C' program to copy contents of one file to another file using command line arguments. [6]

(*c*) Write an algorithm for linear probing without replacement strategy. [6]

P.T.O.

Or

2. (*a*) State advantages and disadvantages of sequential file and index sequential file. [6]

(*b*) Explain the features of a direct file. Write a 'C' program to find the sum of the numbers passed as command line arguments. [6]

(*c*) What are the characteristics of good hash function ? How can collision be resolved in a hash table. [6]

3. (*a*) What is stack ? Write an algorithm to implement stack using linked list. [8]

(*b*) Transform each of the following infix expression to postfix form using stack. Show clearly the contents of stack : [8]

(*i*) D – B + C

(*ii*) A * B + C * D

(*iii*) (A + B) * C – D * F + C

(*iv*) (A – C) * (B + C – D * E) * F).

Or

4. (*a*) Define implicit and explicit stack. What is the importance of stack in recursion ? Explain with suitable example. [8]

(*b*) Clearly indicate the contents of stack for evaluating the following postfix expressions. [8]

Assume :

A = 8, B = 6, C = 10, D = 5, E = 7

AB – CD/* E +.

5. (*a*) What are the disadvantages of linear queue. Write a 'C' program to implement linear queue using linked organization. [8]

(*b*) Write a pseudo C code for implementation of circular queue using array. [8]

Or

6. (*a*) Write a 'C' program to implement deque using linked organization. [8]

(*b*) Write a pseudo C code for implementation of priority queue. [8]

SECTION II

7. (*a*) Define the following with respect to trees with examples : [8]

(*i*) Complete binary tree

(*ii*) Predecessor and successor

(*iii*) Height of tree

(*iv*) Skewed binary tree.

(*b*) Write functions for non-recursive inorder and preorder traversals for binary trees. [8]

Or

8. (*a*) Construct a binary tree from the given traversals : [8]

Preorder : * + a – bc/–de – + f g h

Inorder : a + b – c * d – e/f + g – h.

(*b*) Write non-recursive preorder traversal algorithm for inorder threaded binary tree. [8]

9. (*a*) Write an algorithm to perform DFS traversal for a graph. Perform the same for the given graph (Refer Fig. 1) : [8]

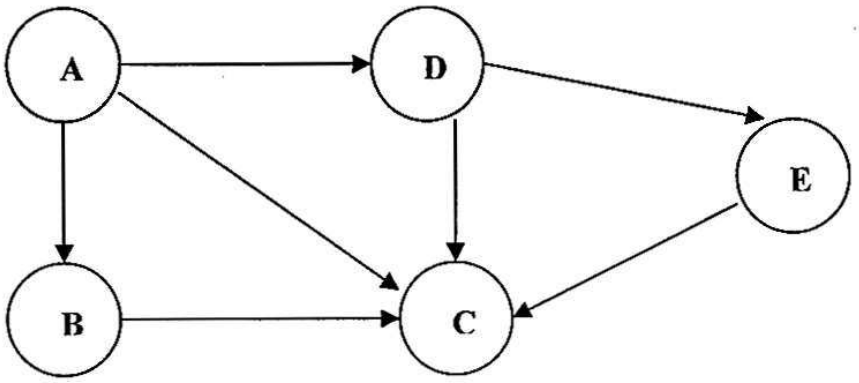


Fig. 1

(*b*) Define the following with respect to graph with examples : [8]

(*i*) Degree of node

(*ii*) Isolated node

(*iii*) Path

(*iv*) Cycle.

Or

10. (*a*) For the graph given below find minimum spanning tree using Prim's algorithm. Show stepwise representation (Refer Fig. 2) : [8]

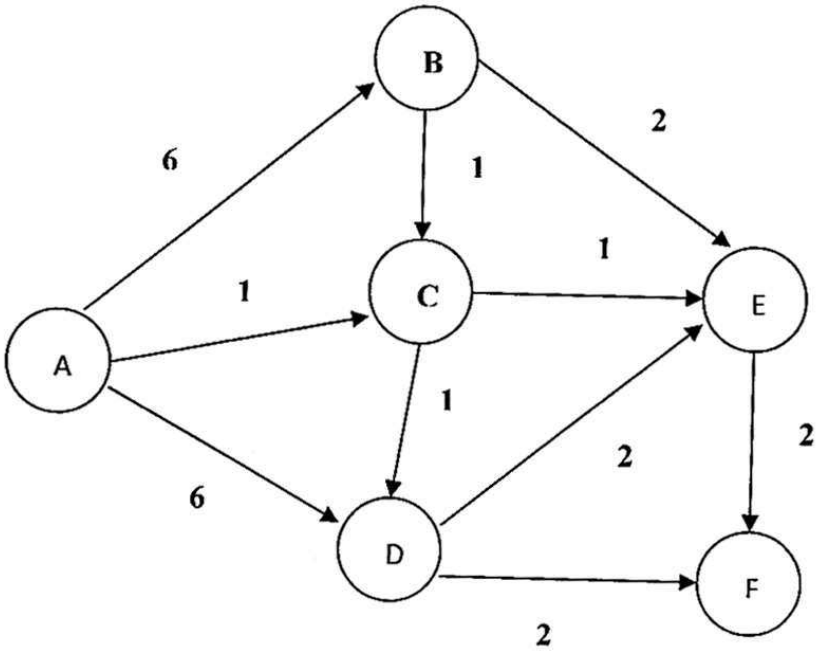


Fig. 2

(*b*) Define a graph. For the given adjacency matrix draw the graph and its adjacency list : [8]

	A	B	C	D	E	F	G	H
A	0	1	1	0	0	0	0	0
B	1	0	0	0	1	0	0	0

C	1	0	0	1	0	1	0	0
D	0	0	1	0	0	0	0	1
E	0	1	0	0	0	0	1	0
F	0	0	1	0	0	0	1	1
G	0	0	0	1	0	1	0	0
H	0	0	0	1	0	1	0	0

11. (*a*) Define AVL tree. For the given data, build an AVL tree and show the balance factor and type of rotation at each step. [10]

64, 1, 44, 26, 13, 110, 98, 85.

(*b*) For the data given below build a Huffman tree and find code of each symbol : [8]

Character	Weight	Character	Weight	Character	Weight
A	10	I	4	R	7
C	3	K	2	S	5
D	4	M	3	T	12
E	15	N	6	U	5
G	2	O	8		

Or

12. (*a*) Sort the following numbers in ascending order using heap sort. Show the sorting stepwise : [10]

77, 62, 14, 9, 30, 21, 80, 25, 70, 55.

(*b*) Distingusih between Huffman's tree, OBST and AVl in terms of their definition and application. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-197

S.E. (I.T.) (Second Semester)

EXAMINATION, 2015

DATA COMMUNICATION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of calculator is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw ISO-OSI reference model. What are the responsibilities of : [8]

(*i*) Physical layer

(*ii*) Data link layer

(*iii*) Network layer.

(*b*) Explain PCM with the help of block diagram in detail. What are the Distortions in PCM ? How is it eliminated ? [10]

P.T.O.

Or

2. (*a*) Explain Nyquist bit rate and Shannon capacity theorem. [8]

(*b*) Explain various transmission impairments present in Data communication. [10]

3. (*a*) Explain TDM and Statistical TDM with the help of diagram. [8]

(*b*) Explain BPSK and QAM. Draw constellation diagram of it. [8]

Or

4. (*a*) Explain the following shift keying techniques with suitable examples : [8]

(*i*) ASK

(*ii*) FSK

(*iii*) PSK

(*iv*) QAM.

(*b*) Explain the concept of multiplexing. Explain FDM and WDM. [8]

5. (*a*) Draw an electromagnetic spectrum for wireless communication. Explain Ground wave, Sky wave and Space wave propagation. [8]

(*b*) Explain the terms ADSL, ADSL lite, HDSL, and SDSL. [8]

Or

6. (*a*) Draw frequency spectrum for wireless communication and explain various types of unguided media. [8]

(*b*) What is switching network ? Explain different methods of switching. [8]

SECTION II

7. (*a*) What is ARQ ? Explain different techniques of ARQ. [8]

(*b*) What is HDLC ? Explain with the help of its frame format. [8]

Or

8. (*a*) Explain error detection and error correction in block coding. [8]

(*b*) What is CRC ? Generate the CRC code for message 1001101010. Given generator polynomial $g(x) = x^4 + x^2 + 1$. [8]

9. (*a*) Discuss CSMA/CA random access technique. How collision avoidance is achieved in this technique ? [8]

(*b*) Explain pure and slotted aloha. [8]

Or

10. (*a*) Discuss Gigabit Ethernet with reference to the following : [8]

(*i*) MAC Sub Layer

(*ii*) 1000 BaseX specification.

(*b*) Explain FDMA, TDMA and CDMA. [8]

11. Write short notes on : [18]

(*a*) Connecting Devices

(*b*) SONET Layers

(*c*) Backbone Networks.

Or

12. Write short notes on : [18]

(*a*) Virtual LAN

(*b*) Working of Switch and Router

(*c*) Two-layer and Three-layer switches.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-198

S.E. (Information Technology) (Second Semester)

EXAMINATION, 2015

PROCESSOR ARCHITECTURE AND INTERFACING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right side indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw and explain 80386 real mode programmers model. [10]

P.T.O.

(*b*) Explain significance of the following signals of 80386 : [8]

(*i*) NA'

(*ii*) LOCK'

(*iii*) ADS'

(*iv*) BS16'

Or

2. (*a*) Draw timing diagram of address pipelined and non-pipelined read machine cycle for 80386 and list activities carried out in sequence. [10]

(*b*) Explain memory segmentation of 80386 microprocessor in real mode. [8]

3. (*a*) Compare and contrast : [8]

(*i*) .COM & .EXE programs

(*ii*) MACRO & PROCEDURE

(*b*) Explain the significance of the following assembler directives : [8]

(*i*) PUBLIC

(*ii*) DW

(*iii*) .STACK

(*iv*) EVEN

Or

4. (*a*) Explain any *four* addressing modes of 80386 showing physical address generation with example. [8]

(*b*) Draw and explain control word format for I/O and BSR mode of 8255. [8]

5. (*a*) How 80386 processor translates logical address into linear address ? [8]

(*b*) What is descriptor cache and TLB ? When they are accessed by 80386 ? What is its use ? [8]

Or

6. (*a*) How can pages be protected in 80386 microprocessor ? Explain in detail. [8]

(*b*) Write privilege checks performed by 80386 while accessing code or data with protection mechanism. List privileged and I/O sensitive instruction of 80386. [8]

SECTION II

7. (*a*) What is TSS and TSS descriptor ? Explain the function and reaction of 80386 when the task switch occurs. [10]

(*b*) What is IDT & IDTR ? What is the difference between the trap gate descriptor and the interrupt gate descriptor ? [8]

Or

8. (*a*) Compare real mode and protected mode of 80386 with respect to segmentation, interrupts processing, privilege protection and register access. [12]

(*b*) Explain the working of confirming code segment. [6]

9. (*a*) List features of 8051 and draw its internal architecture. [8]

(*b*) List interrupt sources of 8051 with vector address and priority. Draw format of IE and IP registers with their significance. [8]

Or

10. (*a*) List addressing modes of 8051 with example. [8]

(*b*) Compare with respect to use and operations carried out by 8051 : [8]

(*i*) ACALL & LCALL

(*ii*) SJMP & AJMP.

11. (*a*) Explain timer modes of 8051 with the help of TMOD and TCON registers. [8]

(*b*) List the features of PIC microcontroller and write a comment on Harward architecture of PIC microcontroller. [8]

Or

12. (*a*) State serial communication modes of 8051 with the help of SCON register and write steps for serial port programming. [8]

(*b*) List the features of Texas MSP 430. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-199

S.E. (IT) (Second Semester) EXAMINATION, 2015

COMPUTER GRAPHICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What do you mean by Computer Graphics ? Give different applications of Computer Graphics. [4]

(*b*) Explain display file structure and role of display file interpreter. [6]

(*c*) Explain DDA circle drawing algorithm. [6]

P.T.O.

Or

2. (*a*) Explain DDA line drawing algorithm with suitable example. [10]

(*b*) Explain any *two* character generation methods. [6]

3. (*a*) Explain rotation of a triangle (A, B, C) about an arbitrary point P(x, y) in space. [8]

(*b*) Explain 3D rotation. How is it different than 2D rotation ? [8]

Or

4. (*a*) Explain boundary fill polygon filling method. State its limitations. [8]

(*b*) Explain the following : [8]

(*i*) Screen coordinates

(*ii*) World coordinates

(*iii*) Window

(*iv*) Viewport.

5. (*a*) Explain perspective projection and parallel projection. [8]

(*b*) Explain parametric cubic curves. [6]

(*c*) Explain concept of vanishing point. [4]

Or

6. Write short notes on : [18]

(*i*) Sweep representation

(*ii*) Polygon surfaces

(*iii*) B-spline Curve.

SECTION II

7. (*a*) Explain the following color model : [8]

(*i*) RGB color model

(*ii*) Color Mixing.

(*b*) Explain raster animations and double buffering. [8]

Or

8. (*a*) Explain need of computer animation and types of computer animation in detail. [10]

(*b*) Explain different steps used in design of animation sequence. [6]

9. (*a*) Explain Gaurand Shading model. State advantages and limitations of it. [8]

(*b*) Explain different components of local illumination model. Explain different basic light sources. [10]

Or

10. (*a*) Explain ray tracing algorithm. [6]

(*b*) Explain Diffuse reflection illumination model. [6]

(*c*) Explain local and global illumination. [6]

11. (*a*) Explain features of any Graphics tool that you have studied. [6]

(*b*) What do you mean by interactive computer graphics ? [4]

(*c*) Explain antialiasing with example. [6]

Or

12. Write short notes on : [16]

(*i*) Texture mapping

(*ii*) Bezier curves

(*iii*) Fractal lines and surfaces

(*iv*) Koch curve.

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+2**

Seat No.	

[4757]-202

S.E. (Printing) (First Semester) EXAMINATION, 2015

STRENGTH OF MACHINE ELEMENTS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) For the rectangular block of size 250 × 100 × 80 mm, is subjected to a force system of 1000 kN (comp), 480 kN tensile and 900 kN tensile, as shown in Fig. 1. Find the strains in the

P.T.O.

direction of each force, if Poisson's ratio is 0.25. Further if $E = 2 \times 10^5$ MPa, calculate the values of modulus of rigidity and bulk modulus for the block material and also the change in volume of the block. [8]

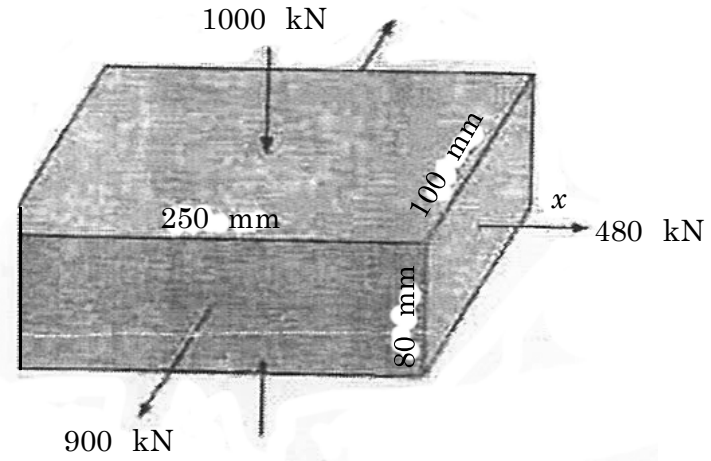


Fig. 1

(*b*) A load of 270 kN is applied on a short concrete column 250 mm × 250 mm. The column is reinforced with 8 bars of 16 mm diameter each. If the modulus of elasticity for steel is 18 times that of concrete, find the stresses in concrete and steel. If the stress in concrete shall not exceed 4 MPa, find the area of steel required so that the column may support a load of 400 kN. [8]

Or

2. (*a*) A 25 mm diameter steel rod of length l_1 = 900 mm has a bronze sleeve of external diameter 30 mm and length l_2 = 300 mm. the sleeve is shrunk on the rod so that the two components are securely bonded as shown in Fig. 2. Find the total elongation of the steel rod due to the rise in temperature of 200 degree Celsius. Take : [8]

$E_s = 2 \times 10^5$ MPa, $E_b = 1 \times 10^5$ MPa, $\alpha_s = 1.2 \times 10^{-5}$ per deg C, $\alpha_b = 2.03 \times 10^{-5}$ per deg C.

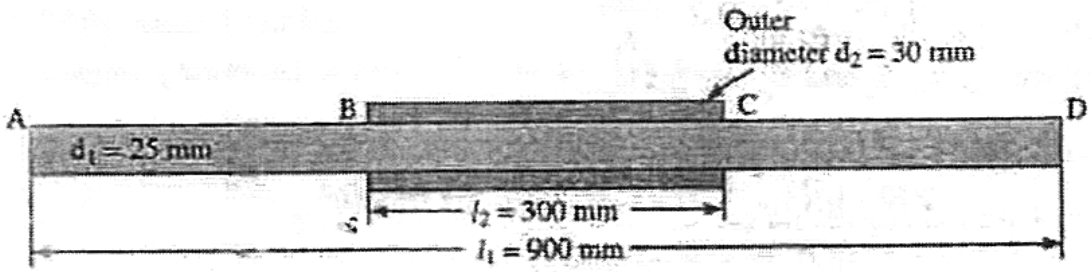


Fig. 2

(*b*) Define : Linear stress, Poisson's ratio, Modulus of rigidity, Factor of safety. [8]

3. (*a*) Draw the shear force and bending moment diagram for the cantilever as shown in Fig. 3 : [8]

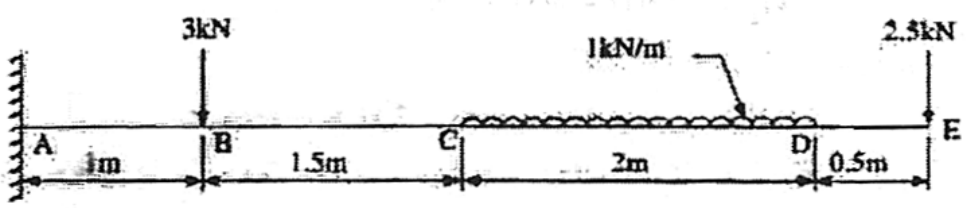


Fig. 3

(*b*) Draw the shear force and bending moment diagram for the beam as shown in Fig. 4. The beam is simply supported at A and C. Also locate the point of contraflexure in any. [10]

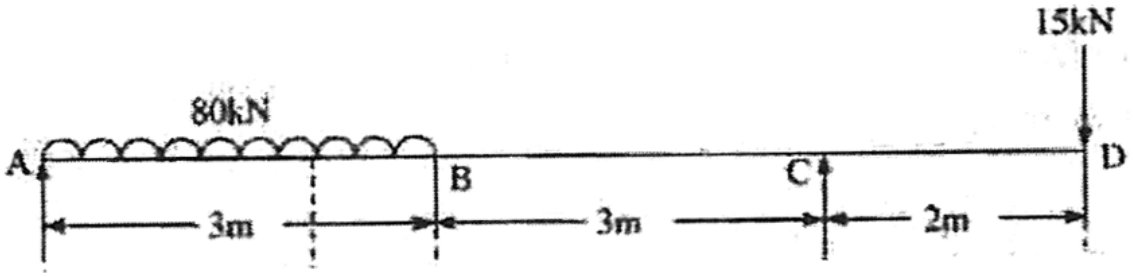


Fig. 4

Or

4. (*a*) Draw the shear force and bending moment diagram for the beam as shown in Fig. 5 : [8]

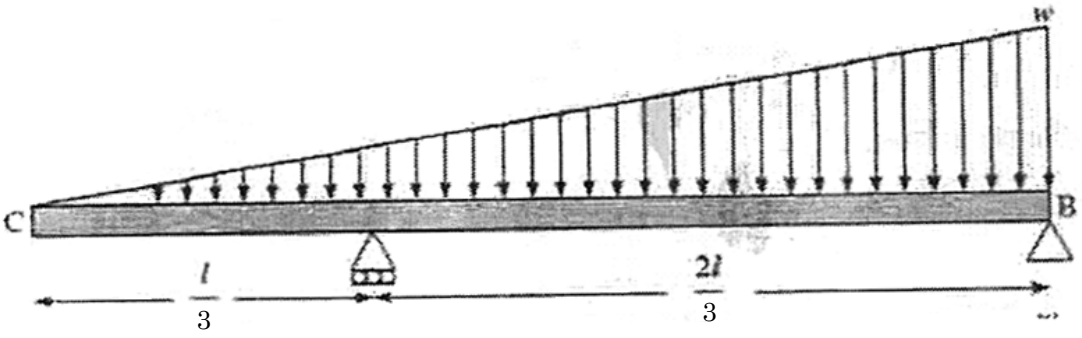


Fig. 5

(*b*) Draw the shear force and bending moment diagram for the beam as shown in Fig. 6. Also locate the point of contra-flexure in any : [10]

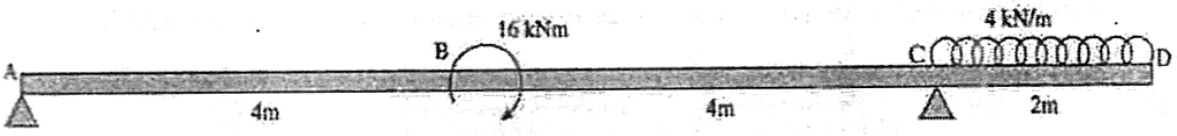


Fig. 6

5. (*a*) Fig. 7 shows an inverted steel channel of size 100 mm × 280 mm with uniform thickness of 15 mm used as a simply supported beam of 3 m span and carries two equal concentrated loads at points distant 0.3 m from each support. Find the values of each of these loads if the maximum tensile stress is not to exceed 95 MPa. Find also the corresponding maximum compressive stress. [8]

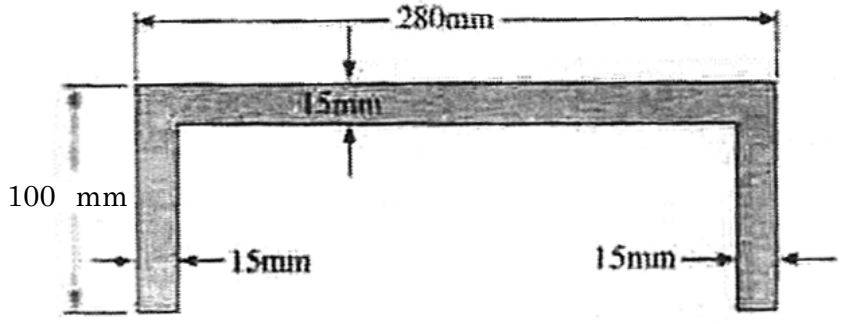


Fig. 7

(*b*) Derive the relationship for Shear stress intensity in beams i.e. $\tau = SAy/bI$. Mention the assumptions taken. [8]

Or

6. (*a*) Two wooden planks are connected together to form a T cross section of a beam as shown in Fig. 8. If a bending moment of 3400 N-m is applied about its horizontal axis, find the bending stresses at the extreme fibers of the section. Also calculate the total tensile force on the cross-section. [8]

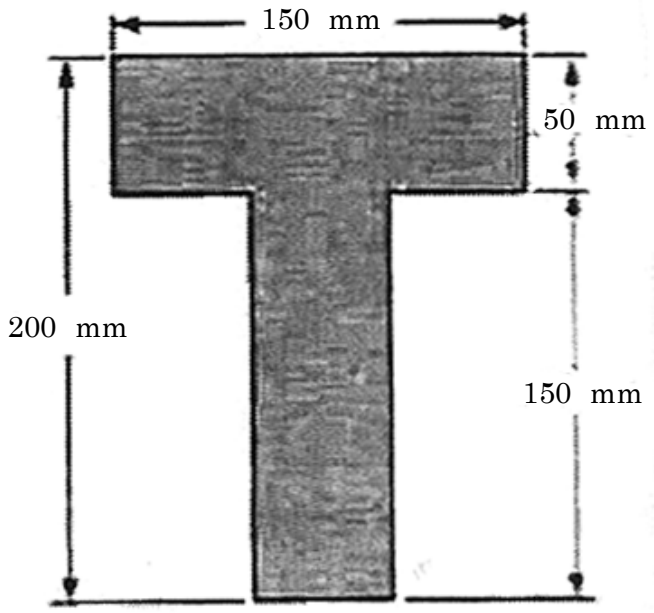


Fig. 8

(*b*) For the section shown in Fig. 9, find the shear stresses at A, B, C, D for a shearing force of 200 kN and find the ratio of the maximum to mean shear stresses : [8]

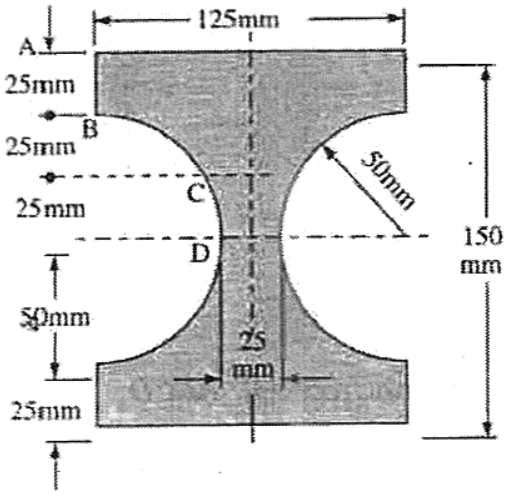


Fig. 9

SECTION II

7. (*a*) A hollow shaft having I.D. 60% of O.D. is to replace a solid shaft transmitting the same power at the same speed. Calculate the percentage saving in the material, if the material to be used is also the same. [8]

(*b*) Derive the relationship for the crippling load for column with one end fixed and other end hinged (pinned). [8]

Or

8. (*a*) Derive the expression for the maximum torque transmitted by a hollow circular shaft. State clearly the assumptions made. [8]

(*b*) Determine the crippling load for a timber section 15 cm × 20 cm having a length of 6 meters and both ends fixed, if the E for timber is 17.5 kN/mm^2. Also calculate the safe load for the same column, if FOS is 3. [8]

9. (*a*) Write short notes on : [8]

(*i*) Maximum Shear Stress theory

(*ii*) Maximum Principal Stress theory.

(*b*) A load of 100 N falls through a height of 2 cm on to a collar rigidly attached to the lower end of a vertical bar 1.5 m long and of 1.5 cm^2 c/s area. The upper end of the vertical bar is fixed. Determine : [8]

(*i*) Maximum instantaneous stress induced in the vertical bar.

(*ii*) Maximum instantaneous elongation

(*iii*) Strain energy stored in the vertical bar.

Or

10. (*a*) A bolt is subjected to an axial pull of 9 kN and a transverse shear force of 4.5 kN. Determien the diameter of the bolt based on : [8]

(*i*) Max. Principal stress theory

(*ii*) Max. principal strain theory

Assume elastic limit in simple tension as 225 N/mm^2 and Poisson's ratio = 0.3, with FOS = 3.

(*b*) The normal stress in two mutually perpedicular directions are 600 N/mm^2 and 300 N/mm^2 both tensile. The complementary shear stresses in these directions are 450 N/mm^2. Find the normal and the tangential stresses on the two planes which are equally inclined to the planes carrying the normal stresses mentioned above. [8]

11. (*a*) Derive the expression for the max. deflection and max. slope for a cantilever beam of length L and carrying a u.d.l. of 'w' kN/m over its entire span. [8]

(*b*) Determine the slope and deflection at point C for the beam as shown in Fig. 10 : [10]

Take E = 2 × 10^5 N/mm^2 and I = 5 × 10^8 mm^4.

Use Macaulay's method.

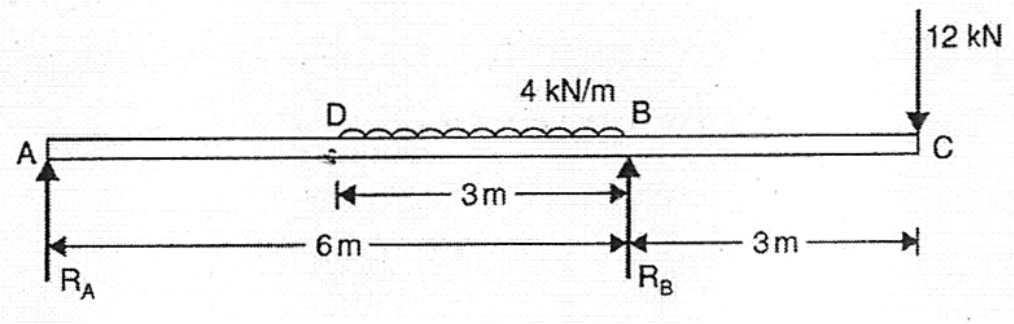


Fig. 10

Or

12. (*a*) Calculate the slope and deflections at the free end for the cantilever beam shown in Fig. 11. Take E = 10^5 N/mm^2 and I = 10^8 mm^4. Use Macaulay's method. [10]

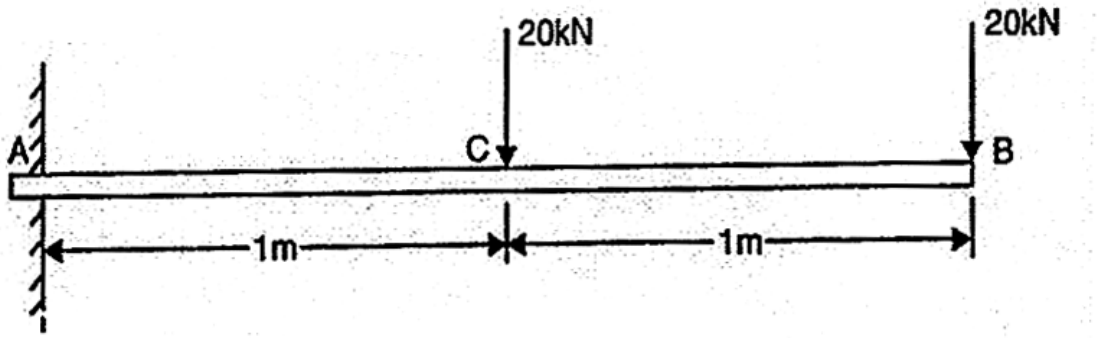


Fig. 11

(*b*) Derive the expression for the max. slope and max. deflection for a simply supported beam with u.d.l. [8]

Total No. of Questions—**6**] [Total No. of Printed Pages—**2**

Seat No.	

[4757]-203

S.E. (Printing) (I Sem.) EXAMINATION, 2015

BASIC ELEMENTS OF PRINTING TECHNOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

SECTION I

1. Solve any *one* : [18]

(A) Explain Computer to Plate for Flexo printing process.

(B) Explain surface preparation and CTP for Gravure printing process.

2. Answer any *one* : [16]

(A) Explain the working principle of Offset printing machine.

(B) Explain the direct and indirect screen printing process.

3. Explain any *one* post-operation : [16]

(A) UV Lamination

(B) Embossing.

P.T.O.

SECTION II

4. Answer any *one* : [16]

(A) Explain the concept of Graphic Design.

(B) Explain different stages of layouting.

5. What different parameters have to consider for Magazine design ? [16]

Or

What different parameters have to consider for Text-book design ?

6. Explain the softwares used for vector drawing. [18]

Or

Explain the software used for photo-editing.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-204

S.E. (Printing) (First Semester) EXAMINATION, 2015

PRINTING DIGITAL ELECTRONICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

Section I

1. Perform the following conversions :

(*a*) $(123)_{10}$ to binary

(*b*) $(126)_{8}$ to Decimal, Binary and Excess-3

(*c*) $(AFB)_{16}$ to BCD, Binary, Excess-3 [18]

Or

2. (*a*) Find the circuit to convert 4-bits binary numbers to 4-bits BCD codes. Write truth table K-maps and circuit. [10]

(*b*) Write short notes on : [8]

(*i*) Bar code and its applications

(*ii*) ASCII code.

3. (*a*) Implement using NOR-NOR logic : [8]

$$Y = AC + BC + AB + D$$

P.T.O.

(*b*) The functionality of a hand held machine is expressed as : [8]

$f(A, B, C, D) = \Sigma m\ (8, 9, 10, 12, 13, 15) + d(1, 2, 3)$

Minimize using K-map and draw the simplified diagram.

Or

4. (*a*) Compare TTL, CMOS, and ECL logic families on the basis of the following : [4]

(*i*) Propagation delay

(*ii*) Noise margin.

(*b*) Prove that : [12]

(*i*) $A \cdot (B + C) = (A \cdot B) + A \cdot C$

(*ii*) $A + \overline{A} \cdot B + A \cdot \overline{B} = A + B$

(*iii*) $A + (B + C) = (A + B) + C$.

5. (*a*) Design a full adder using 2 half adders. [4]

(*b*) Design a half subtractor. [4]

(*c*) A design a logic circuit that has 3 inputs and one output. The output is high when the sum of all the bits in a number is 1. The output is low otherwise. [8]

Or

6. (*a*) Design a one bit comparator. [4]

(*b*) Perform the following : [12]

(*i*) $(111101)_2 - (100)_2$

(*ii*) Perform BCD addition and write your answer in BCD

(*iii*) $(24)_{10} + (76)_{10}$.

(*iv*) $(11100)_2/(110)_2$.

Section II

7. (*a*) Explain clocked SR flip-flop with the help of truth table. Using SR flip-flop explain T flip-flop. [10]

(*b*) Design and explain mod 3 counter. Draw timing diagrams. [8]

Or

8. (*a*) Design and explain J-K flip-flop. Write truth table. [10]

(*b*) Explain any *one* application of counter in printing. [8]

9. (*a*) What is DAC ? Explain the working of any *one* type of DAC with a neat diagram. [8]

(*b*) Explain programmable logic array with example. [8]

Or

10. (*a*) Explain seven segment LED display. [8]

(*b*) What are memories ? State and explain various types of memories. [8]

11. (*a*) Applications of digital electronics in printing. [8]

(*b*) Write short notes on (any *two*) : [8]

(*i*) Joystick

(*ii*) Floppy Disk

(*iii*) Digital camera.

Or

12. Write short notes on (any *four*) : [16]

(*a*) Digital scanner

(*b*) Operation of mouse

(*c*) Input-Output devices of a computer

(*d*) Serial and Parallel ports

(*e*) Keyboard.

Total No. of Questions—**6**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-205

S.E. (Printing) (First Semester) EXAMINATION, 2015
TECHNOLOGY OF PRINTING MATERIALS
(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) *All* questions are compulsory.

(*ii*) Answers to the two Sections should be written in separate answer book.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

SECTION I

1. (*a*) Explain the role of Aluminium as a image carrier in the Lithography. [8]

(*b*) Describe the classification of Polymerization. [8]

Or

(*a*) Explain the role of Copper in printing. [8]

(*b*) Explain various types of plastics used in packaging. [8]

2. (*a*) Explain the procedure of making Negatives and Positives in brief. [8]

P.T.O.

(*b*) Explain the role of various ingredients used in photographic emulsion. [8]

Or

(*a*) Explain the procedure of preparing the screen by photographic method. [8]

(*b*) Explain the role of fountain solution in the lithography. [8]

3. (*a*) Explain the type of ink used in Gravure printing process with properties. [9]

(*b*) Explain the role of additives in printing ink along with suitable examples. [9]

Or

(*a*) Explain the procedure of measuring the viscosity of the paste ink. [9]

(*b*) Explain the different types of pigments used in printing inks. [9]

SECTION II

4. (*a*) Explain the Light fastness and Rub resistance properties of ink with suitable examples. [8]

(*b*) Describe the procedure of determining moisture content in the paper. [8]

Or

(*a*) Differentiate between Process inks and Spot/Special inks. [8]

(*b*) Write the importance of thickness of the paper with reference to the procedure of thickness gauge. [8]

5. (*a*) Draw a neat diagram of Fourdrinier machine and name the parts. [8]

(*b*) State the importance of the fillers in the paper. [8]

Or

(*a*) Comment on any *two* : [8]

(*i*) Beater

(*ii*) Conical refiner

(*iii*) Hydrapulper.

(*b*) Describe in detail the theory of internal sizing in the paper. [8]

6. (*a*) Describe in short any *two* : [9]

(*i*) Bursting strength

(*ii*) Acidity and pH

(*iii*) Brightness.

(*b*) Write in detail the procedure of determining the grammage of paper. [9]

Or

(*a*) Comment on any *two* : [9]

(*i*) Tensile strength

(*ii*) Dimensional stability

(*iii*) Opacity.

(*b*) Describe in detail the procedure of determining the ash content in the paper and state the importance of ash content in paper with respect to printing. [9]

Total No. of Questions—**6**] [Total No. of Printed Pages—**2**

Seat No.	

[4757]-206

S.E. (Printing Engineering) (Second Semester)

EXAMINATION, 2015

REPRODUCTION TECHNIQUES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** Solve any *three* questions from each Section.

SECTION I

1. State important properties of Digital Originals for Print Production. [18]

Or

Compare conventional and digital originals. [18]

2. Why is Halftone dot production needed ? Explain AM screening properties in detail. [16]

Or

Explain film manufacturing process in detail. [16]

3. State relationship between additive and subtractive color theory. [16]

Or

Explain importance and method of grey balance. [16]

P.T.O.

SECTION II

4. State structure and working of a densitometer. [18]

Or

Explain densitometry in detail with applications. [18]

5. State structure and working of a flat bed scanner. [16]

Or

Compare between CCD and CMOS sensors. [16]

6. State advancements in imaging technology with detail features. [16]

Or

Describe laser imaging system in detail. [16]

Total No. of Questions—**6**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-207

S.E. (Printing) (Second Semester) EXAMINATION, 2015

PRINT FINISHING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) *All* questions are compulsory.

(*ii*) Answers to the two Sections should be written in separate answer-book.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain the following binding methods in detail : [9]

(*i*) Full bound

(*ii*) Half bound

(*iii*) Quarter bound.

(*b*) Explain the various binding tools in detail. [9]

P.T.O.

Or

Explain the following binding equipments in detail : [18]

(*i*) Nipping Press

(*ii*) Sewing Frame

(*iii*) Glue Pot

(*iv*) Laying Press/Backing Press.

2. Describe the use of various Adhesives in Binding. Also state the requirements of adhesive in binding. [16]

Or

Write short notes on the following materials used in Book binding : [16]

(*a*) Reinforcing Material

(*b*) Covering Material

(*c*) Securing Material

(*d*) Book Decorating Material.

3. Explain the following binding methods with suitable diagram : [16]

(*a*) Spiral Binding

(*b*) Comb Binding

(*c*) Wire-O wire Binding.

Or

Explain the step by step pre-forwarding and forwarding operation. [16]

SECTION II

4. Draw a Plant Layout for medium size bindery. What are the aspects on which plant layout will be decided ? [18]

Or

(*a*) Explain the knife folding principle with suitable diagram. [12]

(*b*) List down the merits and demerits of hand folding. [6]

5. (*a*) Calculate number of boards required of 45 Dkg of 22" × 28" for binding of 1000 books in A5 size. [6]

(*b*) Calculate papers for endpapers in RA1 (595 × 841) size with 80 gsm @ Rs. 70 per kg. for 2000 books in A5 size having 240 pages with 2% wastage allowance. [10]

Or

Estimate boards of 45 Dkg in RA1 size and cloth rolls of 85 cm wide and 15 meter long for full bound 5000 books in A5 size having 10 mm thickness. [16]

6. (*a*) Explain the various lamination techniques used in print finishing. [8]

(*b*) Explain the structure and working of wire stitching machine. [8]

Or

Explain the selection of material handling equipment, according to the following criteria : [16]

(*a*) Nature of operations

(*b*) Material to be handled

(*c*) Distance over which the material is to be moved

(*d*) Installation and operating costs

(*e*) Plant facilities.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-208

S.E. (Printing) (Second Semester) EXAMINATION, 2015

MICROPROCESSOR AND MICROCONTROLLER TECHNIQUES IN PRINTING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Draw neat diagrams wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

(*v*) Use of logarithmic tables, electronic pocket calculators is allowed.

SECTION I

1. (*a*) Differentiate between the following :

(1) I/O mapped I/O and memory mapped I/O

(2) Software and hardware interrupts. [8]

(*b*) Explain the flag register of 8085 in detail. [8]

P.T.O.

Or

2. (*a*) Draw and explain the block diagram of 8085 in detail. [10]

(*b*) Explain the following pins of 8085 microprocessor : [6]

(1) ALE

(2) S1 and S0

(3) IO/Mbar

3. (*a*) Explain unconditional jump and different conditional jump instructions in 8085. [10]

(*b*) Explain various addressing modes of 8085 with proper example. [8]

Or

4. (*a*) Explain what operation will take place when the following instructions are executed : [12]

(1) LDAX D

(2) LHLD 2000

(3) RAL

(4) MOV A, B

(5) XRI 20

(6) PCHL

(*b*) Draw and explain the timing diagram for the instruction ADD B. [6]

5. (*a*) Draw pin diagram of 8051 microcontroller and explain different pins in detail. [10]

(*b*) Explain SCON (serial port control register) in 8051 microcontroller. [6]

Or

6. (*a*) Explain memory organization in 8051 microcontroller. [10]

(*b*) Explain program status word (PSW) in 8051 microcontroller. [6]

SECTION II

7. (*a*) Explain different addressing modes in 8051 microcontroller. [10]

(*b*) Explain the following instructions in 8051 : [6]

(1) DA A

(2) ADDC A, # 12

Or

8. (*a*) Explain the following instructions in 8051 : [8]

(1) MOV A, Rn

(2) MUL AB

(3) DIV AB

(4) SWAP A

(5) ADD A,@Rn

(6) MOV A, data

(7) MOV A,@A + DPTR

(8) CLR A

(*b*) Write short notes on : [8]

(1) RS232

(2) IEEE488.

9. (*a*) Explain control word in 8253 programmable timer control. Explain model in 8253. [10]

(*b*) Draw and explain block diagram of IC8251 (Programmable communication interface). [8]

Or

10. (*a*) Explain control word for 8255 programmable peripheral controller. [6]

(*b*) Explain different priority modes in 8259 programmable interrupt controller. [6]

(*c*) Explain mode 2 of 8255 programmable peripheral controller in detail. [6]

11. (*a*) Explain the concept of PLC. [8]

(*b*) Explain printer interfacing with 8085. [8]

Or

12. (*a*) Explain application of microprocessor in field of printing in detail. [8]

(*b*) Write program for stepper motor interface with 8085 microprocessor. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4757]-209

S.E. (Printing) (Second Semester) EXAMINATION, 2015

THEORY OF PRINTING MACHINES

(2008 PATTERN)

Time : Four Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Answer *three* questions from each Section.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

UNIT I

1. (*a*) Define the following terms : [4]

(*i*) Kinematic Chain

(*ii*) Structure

(*iii*) Kinematic Pair and

(*iv*) Degree of freedom in mechanism.

(*b*) Define inversion of mechanism. Explain with the help of neat sketch any *one* inversion of double slider crank chain. Give their applications. [6]

P.T.O.

(*c*) Draw a neat sketch of Ratchet and Pawl arrangement and state its applications. [6]

Or

2. (*a*) Explain 'Scotch Yoke' mechanism with neat sketch. [8]

(*b*) List inversion of four bar chain and explain any *two* with neat sketch. [8]

UNIT II

3. In a mechanism as shown in Fig. 1, link AB rotates clockwise at a speed of 240 rpm. At the instant shown, find velocity and acceleration of slider C as well as those of slider E. Link lengths are AB = 50 mm, BC = 120 mm, BD = DC = 60 mm and DE = 80 mm. [16]

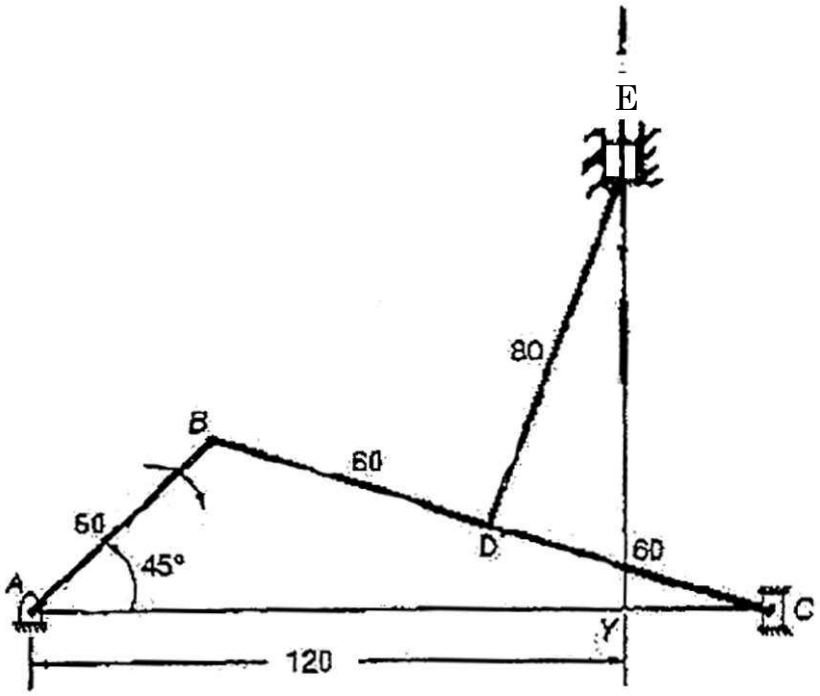


Fig. 1

Or

4. (*a*) In a Toggle mechanism as shown in Fig. 2 the slider D is constrained to move on a horizontal path. The crank OA is rotating in the anticlockwise direction at a speed of 180 r.p.m.

The dimensions of various links are as follows :

OA = 180 mm, CB = 240 mm, AB = 360 mm and BD = 540 mm.

For the given configuration find :

(*i*) Velocity of slider D

(*ii*) Angular velocity of links AB, CB and BD. [12]

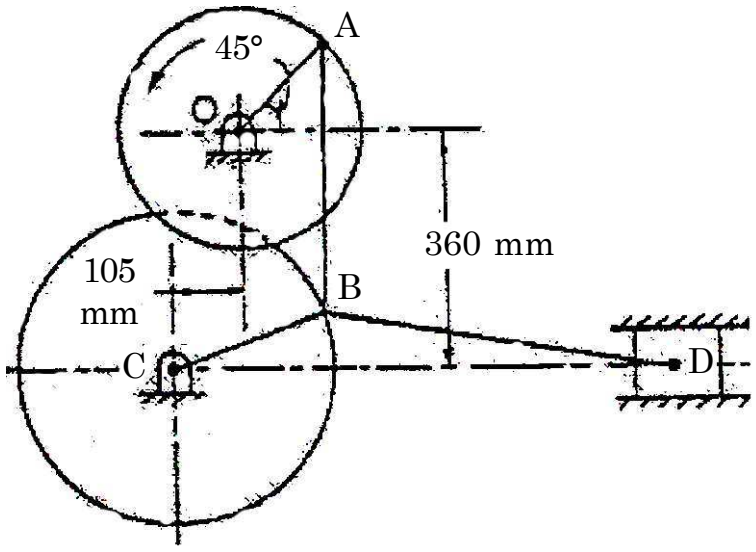


Fig. 2

(*b*) What are centripetal and tangential component of acceleration ? [4]

UNIT III

5. In a Whitworth quick return motion as shown in Fig. 3, OA is a crank rotating at 30 rpm in a clockwise direction. The dimensions of various links are : OA = 150 mm, OC = 100 mm, CD = 125 mm and DR = 500 mm. Determine the acceleration of sliding block R and the angular acceleration of the slotted lever CB. [18]

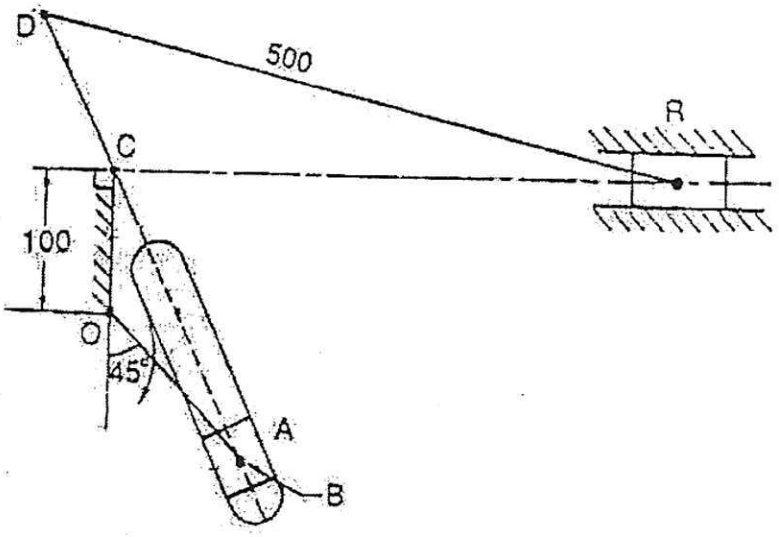


Fig. 3

Or

6. (*a*) What is the Coriolis acceleration component ? How is it determined ? [4]

(*b*) The drawing crank OA rotates at 120 rpm in the clockwise direction for the position of the mechanism shown in Fig. 4. Determine the following : [14]

(*i*) The velocity and acceleration of slider D.

(*ii*) The sliding velocity and sliding acceleration of slider A.

The various dimensions are as follows :

OA = 80 mm, OQ = 40 mm, QC = 60 mm, CD = 200 mm.

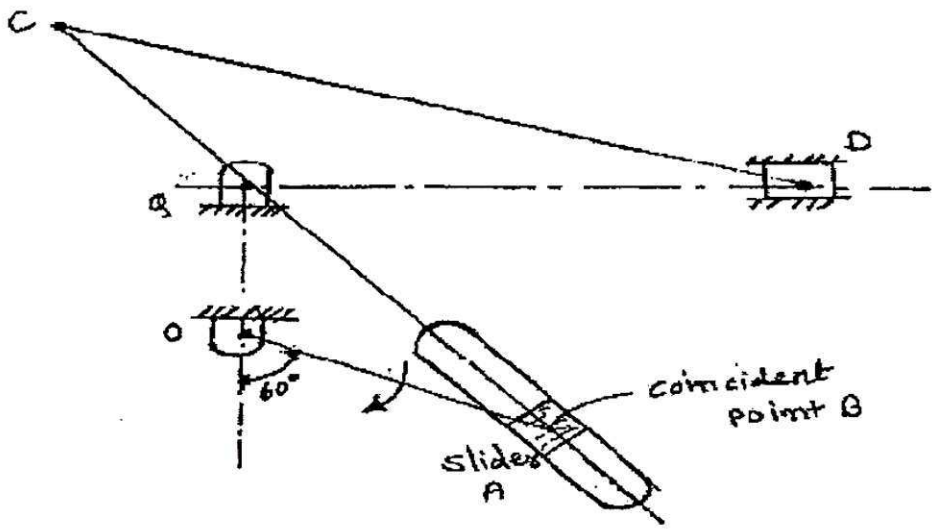


Fig. 4

SECTION II

UNIT IV

7. (*a*) Explain the construction and working of centrifugal clutch with neat sketch. [8]

(*b*) The following data relate to a cone clutch. The maximum and minimum surface contact radius is 150 mm and 125 mm respectively. Semi-cone angle is 20°, allowable normal pressure is 14×10^4 N/m^2, coefficient of friction is 0.25.

Find :

(*i*) axial load and

(*ii*) power transmitted at a speed of 300 rpm. [8]

Or

8. (*a*) Explain the working of the multiplate clutch with the neat sketch and also state its applications. [8]

(*b*) Derive the expression for the torque transmitting capacity of single plate clutch with uniform wear and pressure theory as well. [8]

UNIT V

9. (*a*) Describe the working of band and block brake with neat sketch. [6]

(*b*) A bicycle and rider travelling at 12 km/hr on a level road, have a mass of 105 kg. A brake is applied to rear wheel which is 800 mm in diameter. The normal reaction force at the contact surface is 80 N and the coefficient of friction is 0.06. Find the distance covered by the bicycle and number of turns of its wheel before coming to rest. [10]

Or

10. (*a*) Explain with neat sketch self energing of the brakes. [6]

(*b*) The rope of a winch crab supports a dead weight of 4500 kg mass and is wound round a barrel of 420 mm diameter. A brake drum of 560 mm diameter is keyed to the barrel shaft. A differential band brake acts on the drum with its two ends attached to pins on the opposite sides of the fulcrum of the block lever at 25 mm and 125 mm respectively. The band embraces 70% of the circumference of the drum. The coefficient of the friction is 0.28. Find the least force required to be applied at the end of lever 1 m from the fulcrum. [10]

UNIT VI

11. (*a*) Derive the expression of limiting tension ratio for the flat belt drive. [6]

(*b*) Explain what do you mean by the initial tension in the belt drive and its effect on the power transmission. [6]

(*c*) Compare the belt drive with chain drive. [6]

Or

12. (*a*) Derive the expression for length of flat belt. [8]

(*b*) Write short notes on (any *two*) : [10]

(*i*) Centrifugal tension in belt

(*ii*) Slip and creep in belt

(*iii*) Belt material.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-210

S.E. (Printing) (Second Semester) EXAMINATION, 2015

ELECTRICAL MACHINES AND UTILIZATION

(2008 Pattern)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections must be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

Section I

1. (*a*) Draw and explain the characteristic curves of D.C. shunt motor and D.C. series motor. [8]

P.T.O.

(*b*) A 230 V D.C. shunt motor runs at 800 rpm and takes armature current of 50 A. Find the resistance to be added to the field circuit to increase speed to 1000 rpm at an armature current of 80 A. Assume flux is proportional to field current. Shunt field resistance is 250 Ω and armature resistance is 0.15 Ω. [8]

Or

2. (*a*) Explain construction of a D.C. machine with the help of its cross sectional view. Mention major parts of it and functions. [8]

(*b*) Why is a starter necessary in the operation of DC motors ? Explain the working of Three Point Starter with the help of schematic. [8]

3. (*a*) Derive the expression for torque developed in an induction motor under running conditions. Hence obtain the condition for maximum torque. [8]

(*b*) Explain the construction and working of a shaded pole induction motor with the help of neat sketches. State its applications. [8]

Or

4. (*a*) Distinguish between squirrel cage and slip ring induction motors considering significant points for comparison. [8]

(*b*) The input power to a 6-pole, 3-phase, 50 Hz induction motor is 42 kW; the speed is 970 rpm. The stator losses are 1.2 kW and the friction and windage losses are 1.8 kW. Find : [8]

(*i*) the rotor copper loss, and

(*ii*) efficiency of motor.

5. (*a*) What is Universal Motor ? Describe its construction features and working. [8]

(*b*) Elaborate selection of electrical motors taking into consideration various types of machineries and their load characteristics found in printing industries. [10]

Or

6. (*a*) What is a drive ? Discuss features of individual and group drives. State advantages of electrical drives. [8]

(*b*) Write short notes on : [10]

(*i*) Servo motor

(*ii*) Stepper motor.

Section II

7. (*a*) Two wattmeter are connected to measure the input power in balanced 3-ph load gives 2000 W and 700 W respectively. Find the power factor (1) when both readings are positive and (2) when W_2 reading is obtained after reversing the connection of current coil or pressure coil. [8]

(*b*) Derive the equation for reactive power with one wattmeter method for 3-phase balanced load. Also draw a neat circuit and phasor diagram. [10]

Or

8. (*a*) Derive the equation for active power with two wattmeter method for 3-phase balanced load. Also draw a neat circuit and phasor diagram. [8]

(*b*) Explain in detail relay, contactors and limit switches. [10]

9. (*a*) State the advantages of electric heating. [8]

(*b*) A 18 kW, 1-ph, 220 V resistance oven is to employ circular Ni wire for its heating element. If wire temperature is not to exceed 1170°C and temperature of charge is to be 400°C. Calculate '*d*' and '*l*' of wire. Take $k = 0.57$, $e = 0.95$ and $\rho = 1.09\ \mu\Omega m$. What would be the temperature of element when charge is cold ? [8]

Or

10. (*a*) Describe the different methods for temperature control of resistance furnaces. [8]

(*b*) Explain with neat diagram Dielectric Heating. [8]

11. (*a*) Define the following terms of illumination : [8]

(*i*) Luminous flux

(*ii*) Illumination

(*iii*) Coefficient of Utilization

(*iv*) Luminous Intensity.

(*b*) Explain different methods of energy conservation and its application in printing industry. [8]

Or

12. (*a*) A drawing hall with an area of 15 m × 10 m is to be illuminated with an average illumination of 100 lux. The lamps are to be fitted at 6 m height. Find out the number and size of the lamps required for a η of 20 lumens/W. Take UF = 0.6 and MF = 0.75. [8]

(*b*) Write a short note on safety and maintenance of printing industry. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-212

S.E. (Biotechnology) (First Semester) EXAMINATION, 2015

APPLIED CHEMISTRY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer only *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic table or electronic pocket calculator is allowed.

(*vi*) Assume suitable data if necessary.

SECTION I

1. (*a*) Explain carbonium ion intermediate with its *two* methods of generations and geometry. [6]

(*b*) Draw the resonance structures of : [6]

(*i*) Phenol

(*ii*) Benzene

(*iii*) Nitrobenzene.

P.T.O.

(*c*) Justify the following (*two* marks each) : [6]

(*i*) Guanidine is stronger base.

(*ii*) Cyclooctatetraene is non-aromatic

(*iii*) Monochloroacetic acid is stronger than acetic acid.

Or

2. (*a*) Explain in brief about Hyperconjugation and Steric effect with suitable example. [6]

(*b*) Define Huckel's rule and explain criteria of aromaticity with example. [6]

(*c*) Classify the following compounds as Aromatic, Non-aromatic and Antiaromatic : [6]

(*i*) Pyrrole

(*ii*) Cyclopropenyl cation

(*iii*) Cycobutadiene

(*iv*) Naphthalene

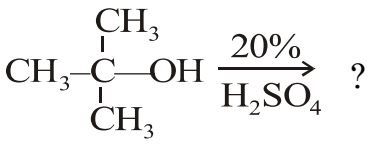
(*v*) Tropylium ion

(*vi*) Annulene.

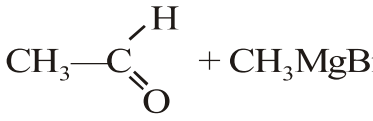
3. (*a*) Explain S_N1 reaction on the basis of mechanism, stereochemistry and energy profile diagram. [6]

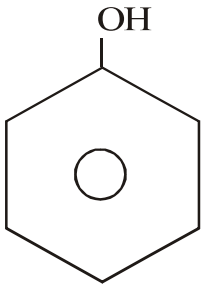
(*b*) Predict the product (**1** mark each) : [6]

(*i*) $CH_3–CH=CH_2 + HBr \xrightarrow{H_2O_2}$?

(*ii*)  ?

(*iii*) $CH_3–CH=CH_2 + HBr \longrightarrow$?

(*iv*)  + $CH_3MgBr \longrightarrow$ complex $\xrightarrow{H^+/H_2O}$?

(*v*)  $\xrightarrow[+\text{conc. } H_2SO_4]{\text{conc. } HNO_3}$? + ?

(*vi*) $CH_3–CH_2–CH_2–Cl \xrightarrow[KOH]{alc}$?

(*c*) Write Beckmann rearrangement with its mechanism. [4]

Or

4. (*a*) Discuss E2-mechanism with suitable example. [6]

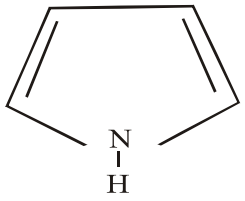
(*b*) Explain Friedel-Crafts alkylation and acylation with suitable example. [6]

(*c*) Write mechanism of Claisen ester condensation reaction with suitable example. [4]

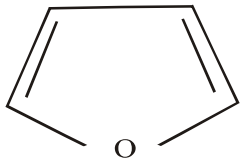
5. (*a*) Define conformational isomerism. Explain conformation in *n*-Butane. [6]

(*b*) Give *one* method of preparation of Furan, Pyrrole and Thiphene. [6]

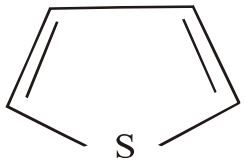
(*c*) Predict the product (*one* mark each) : [4]

(*i*) 

$\xrightarrow[\Delta]{H_2/Ni}$?

(*ii*) 

$+ NH_3 \xrightarrow[\text{Steam}]{Al_2O_3}$?

(*iii*) 

$+ HNO_3 \xrightarrow[\text{anhydride}]{\text{Acetic}}$?

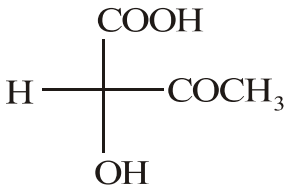
(*iv*) $2HC \equiv CH + HCN \longrightarrow$?

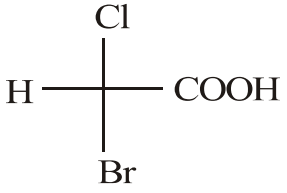
Or

6. (*a*) Explain conformations of cyclohexane with energy profile diagram. [6]

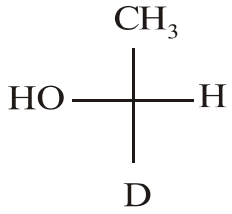
(*b*) Write Skraup synthesis of quinoline. [6]

(*c*) Assign R or S configuration of the following (1 mark each) [4]

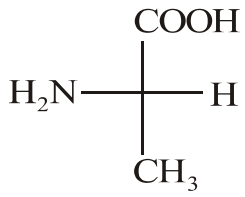
(*i*) 

(*ii*) 

(*iii*)



(*iv*)



SECTION II

7. (*a*) What is vaporization of liquids ? Explain the use of isotenescope apparatus to determine vapour pressure of liquid. [6]

(*b*) Derive Bragg's equation for studying internal structure of solid crystals. [6]

(*c*) (*i*) The time required to flow through Ostwald's viscometer is 2.52 minutes for water and for same volume of organic liquid having density 0.8 g/cc is 4.25 minutes. Find the viscosity of liquid relative to that of water. (Viscosity coefficient of water is 1.002 centipose). [3]

(*ii*) Find the interplanar distance in a crystal in which a series of planes produce a first order reflection from a copper X-ray tube (λ = 1.424 A°) at an angle of 18.5°. [3]

Or

8. (*a*) Describe powder method of measurement of diffraction angle. [6]

(*b*) Define surface tension and explain drop number method by use of stalagmometer to measure surface tension of liquid. [6]

(*c*) (*i*) At 300 °K, surface tension of Ethanol in contact with its vapour is 2.189×10^{-2} Nm^{-1} and its density is 0.584 g/cc. How far up the liquid will rise in a tube of internal radius of 0.02 cm. (g : 980 gm/sec^2). [3]

(*ii*) Calculate the angles at second order reflection obtained from plane 500 pm apart, using x-rays of wavelength 100 pm. [3]

9. (*a*) Derive kinetic gas equation. [6]

(*b*) Describe experimental determination of critical constants. [6]

(*c*) Calculate collision diameter of CO_2 if at 20°C the coefficient of viscosity of CO_2 is 1.58×10^{-5} kg m^{-1} s^{-1}. [4]

Or

10. (*a*) Verify Boyle's law, Charles law and Avogadro's law from kinetic gas equation. [6]

(*b*) Derive van der Walls' equation to explain the deviation of real gases from ideal gas behaviour. [6]

(*c*) Calculate RMS velocity of CO_2 at 37°C. (At. Wt. of C = 12 & O = 16). [4]

11. (*a*) State Raoult's law. How molecular weight of solute can be calculated using Raoult's law ? [6]

(*b*) Explain Berkeley and Hartley experiment to determine the osmotic pressure of dilute solutions. [6]

(*c*) A solution of 0.278 g of an organic substance in 60 g of ethanol had its boiling point raised by 0.482°C. Find the molecular weight of that compound if Kb for 1000 gm of solvent is 1.82. [4]

Or

12. (*a*) Explain Landsberger's method to determine the elevation in boiling point with neat labelled diagram. [6]

(*b*) Define :

(*i*) Molarity

(*ii*) Molality

(*iii*) Mole fraction

(*iv*) Normality

(*v*) Ideal solution

(*vi*) Colligative property. [6]

(*c*) Osmotic pressure of cane sugar at 27°C is 4.42 atm. Calculate its concentration in grams per litre (R = 0.082 At. Wt. of C = 12, H = 01 and O = 16). [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-213

S.E. (Biotechnology) (I Sem.) EXAMINATION, 2015
FLUID FLOW AND UNIT OPERATIONS
(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data if necessary.

SECTION I

1. (*a*) What are Newtonian and non-Newtonian fluids ? Give example of each. [6]

(*b*) Define specific weight and specific volume ? Also state the units. [6]

(*c*) Find the kinematic viscosity of oil having density 980 kg/m^3. The shear stress at a point in oil is 0.35 N/m^2 and velocity gradient 0.4/sec. [6]

P.T.O.

Or

2. (*a*) Write a short note on Newton's law of viscosity. [6]

(*b*) Derive Bernoulli's equation without friction. State the assumption made. [12]

3. (*a*) Differentiate between simple and differential manometer. [6]

(*b*) Derive Hagen Poiseuille equation for laminar flow in circular pipes. [10]

Or

4. (*a*) Differentiate between major and minor losses in pipes. When are minor losses significant ? Explain any *one* minor loss in detail. [8]

(*b*) A sugar syrup is flowing in a pipeline of 55 mm internal diameter at a flow rate of 4 lit/min which has viscosity of 1.5 poise and a density of 1.04 gm/cc. Calculate the pressure drop and friction loss over a length of 10 m. [8]

5. (*a*) Explain phenomenon of cavitation in pumps. How can it be prevented ? [8]

(*b*) What is power curve and how does it help in determining power consumed during agitation ? [8]

Or

6. (*a*) An oil of specific gravity 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venturimeter. Take $C_d = 0.98$. [10]

(*b*) Enlist different minor losses in pipelines. [6]

SECTION II

7. (*a*) Write an explanatory note on batch sedimentation. [8]

(*b*) A steel ball of diameter 40 mm and of density 8500 kg/m^3 is dropped in a large mass of water. The coefficient of drag of the ball in water is given as 0.45. Find the terminal settling velocity of the ball in water. [8]

Or

8. (*a*) Explain with neat sketch venture scrubber. [8]

(*b*) Explain drag and drag force on spherical particle. [4]

(*c*) Explain in detail hinder settling. [4]

9. (*a*) Write short notes on :

(*i*) Vacuum leaf and

(*ii*) Rotary drum filter. [12]

(*b*) Explain the different types of fluidization commonly observed. [4]

Or

10. (*a*) Describe with neat sketch the working and application of plate and frame filter press. [10]

(*b*) What is meant by constant pressure and constant rate filtration ? [6]

11. (*a*) Explain with neat sketch revolving action of Ball mill. Derive expression for critical speed of ball mill. [10]

(*b*) Discuss the following : [8]

(*i*) Jaw Crusher

(*ii*) Vibrating Screen.

Or

12. (*a*) State and explain : [12]

(*i*) Bond's Law

(*ii*) Rittinger's Law

(*iii*) Kick's Law.

(*b*) Derive expression for screen effectiveness. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-214

S.E. (Biotechnology) (I Sem.) EXAMINATION, 2015

MICROBIOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Solve Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data if necessary.

(*v*) Answers to the two Sections should be written in separate answer-books.

SECTION I

1. Write short notes on (**9** marks each) : [18]

(*a*) Spontaneous generation. Who refuted the theory of spontaneous generation ?

(*b*) How do you determine the effectiveness of an antibiotic in sensitivity testing ?

P.T.O.

Or

2. Which method of sterilization is most practical for a heat-sensitive solution of vitamins ? Explain the method. [18]

3. Describe in detail the steps of the Gram-stain procedure. [16]

Or

4. Draw a neat diagram for (**8** marks each) : [16]

(*a*) Fluid mosaic model

(*b*) Cell wall structure of a Gram positive bacteria.

5. Describe (**8** marks each) : [16]

(*a*) What is the function of the cytoplasmic membrane in prokaryotes ?

(*b*) How to culture bacteria ? What is the name of the process ? Explain the method.

Or

6. Answer (**8** marks each) : [16]

(*a*) What is the function of a bacterial cell wall ?

(*b*) Explain the **3** major categories of microbes based on their pH preference.

SECTION II

7. Answer the following (**9** marks each) : [18]

(*a*) How do the lytic cycle and the lysogenic cycle of bacteriophages differ ?

(*b*) Explain the different virus cultivation methods.

Or

8. Answer the following (**9** marks each) : [18]

(*a*) What is the main factor in the Kirby-Bauer antibiotic disk diffusion test is designed to evaluate ?

(*b*) Write a note on multiple drug resistance in bacteria.

9. Write short notes on (**8** marks each) : [16]

(*a*) Sewage treatment

(*b*) Give the common cause of spoilage in food products.

Or

10. Define tuberculosis, with respect to its causative agent, pathogenesis, laboratory diagnosis and treatment. [16]

11. Why are coliform bacteria used as indicator organisms of sewage pollution ? [16]

Or

12. Answer the following (**8** marks each) : [16]

(*a*) Describe the preventive methods for a Cholera infection.

(*b*) Explain the terms :

(*i*) Mutualism

(*ii*) Commensalism.

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-215

S.E. (Biotechnology) (First Semester) EXAMINATION, 2015

BIOCHEMISTRY–I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Solve Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data if necessary.

(*v*) Answers to the two Sections should be written in separate answer book.

SECTION I

1. Depict the flow chart for glycolysis with all enzymes and coenzymes involved in it. Describe in detail the role of each enzyme involved in it. [18]

Or

2. Answer the following : [18]

(*i*) Describe the buffering system in human body.

(*ii*) Explain the furanose and pyranose rings.

P.T.O.

3. Describe and discuss the synthesis of glycogen with special emphasis on the role of nucleoside diphosphate sugars. [16]

Or

4. Draw a general scheme of the pentose phosphate pathway and a flow a chart for oxidative reactions of the pentose phosphate pathway. [16]

5. Describe in detail about : [16]

(*a*) Acid-base properties of amino acids

(*b*) Ion exchange chromatography.

Or

6. Describe in detail about : [16]

(*a*) Affinity chromatography

(*b*) Digestion and absorption of protein.

SECTION II

7. Write short notes on : [18]

(*a*) Ketone bodies

(*b*) Classification of lipids.

Or

8. Write down in detail the synthesis of fatty acid. Describe the synthesis of malonyl CoA. [18]

9. Write in detail about : [16]

(*a*) Covalent structure of nucleic acids

(*b*) Sanger's method for hydrolysis of nucleotides.

Or

10. Write short notes on : [16]

(*a*) Structure of pyrimidines and purines

(*b*) Nucleic acid protein supramolecular complex.

11. Describe the sources, absorption, metabolism, functions and deficiency of any *two* fat soluble vitamins. [16]

Or

12. Write short notes on : [16]

(*a*) Osteomalacia and Osteoporosis

(*b*) Role and deficiencies of any *two* minerals.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-216

S.E. (Biotechnology) (Second Semester)

EXAMINATION, 2015

BIOCHEMISTRY–II

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Solve Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6**, Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12**.

(*ii*) Neat diagrams must be drawn whenever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

(*v*) Answers to the two Sections must be written in separate answer-books.

SECTION I

1. Explain in detail about the experiment which elucidate the 'amino acid sequence of a protein determines its three-dimensional structure'. [18]

P.T.O.

Or

2. Write short notes on : [18]

(*a*) Myoglobin

(*b*) Hemoglobin.

3. Describe in detail about : [16]

(*a*) Allosteric enzyme

(*b*) Regulatory enzyme.

Or

4. Write short notes on : [16]

(*a*) Proteolytic activation

(*b*) Classification of enzyme.

5. Write short notes on : [16]

(*a*) Biotin

(*b*) Pyridine nucleotide.

Or

6. Write short notes on : [16]

(*a*) Competitive inhibition of enzyme

(*b*) Non-competitive inhibition.

SECTION II

7. Write in detail about : [18]

(*a*) Serpentine receptor

(*b*) Schematic of epinephrine cascade.

Or

8. Write in detail about : [18]

(*a*) Functions of thyroid and growth hormone.

(*b*) Draw a schematic for hierarchical organization of endocrine regulation under the control of Hypothalamus.

9. Answer the following : [16]

(*a*) Describe in detail about the structure and function of sarcomere.

(*b*) Active and passive transport.

Or

10. Write short notes on : [16]

(*a*) Movement of Kinesin along a microtubule in muscle contraction.

(*b*) Role of calcium in muscle contraction.

11. Answer the following : [16]

(*a*) Enzyme tests used for monitoring heart disease.

(*b*) Describe the hyperglycemia and hypoglycemia.

Or

12. Define the terms and detail symptoms of keratomalacia, termatitis, scurvy and dementia. [16]

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-217

S.E. (Biotechnology) (Second Semester) EXAMINATION, 2015

CELL BIOLOGY AND TISSUE CULTURE

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from each Section.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Neat diagrams must be drawn wherever necessary.

SECTION I

1. Differentiate between animal cell and plant cell. Explain any *two* cell organelle having their own DNA. [18]

Or

2. Describe briefly the structure and functions of any *two* cell organelles involved in protein modification. [18]

3. Explain with the examples symport, antiport, uniport transport of molecules. Add a note on passive transport of molecules. [16]

P.T.O.

Or

4. Answer the following (**8** marks each) : [16]

(*a*) Transport of molecules in and out of nucleus

(*b*) Facilitated cell diffusion.

5. Discuss the following (**8** marks each) : [16]

(*a*) Enzyme linked cell surface receptor

(*b*) Different types of cell signaling molecules.

Or

6. Describe briefly (**8** marks each) : [16]

(*a*) Differentiate components of Extracellular matrix

(*b*) Cell-Cell and Cell-ECM interaction.

SECTION II

7. With the help of neat labelled diagram describe the process of Somatic cell division. Add a note on cell cycle regulation. [18]

Or

8. Discuss the following (**9** marks each) : [18]

(*a*) Programmed cell death

(*b*) Different phases of cell cycle.

9. Write short notes on (**8** marks each) : [16]

(*a*) Nervous tissue and action potential

(*b*) Fluid connective tissue.

Or

10. Explain the different types of the epithelial tissue. Add a note on stem cells. [16]

11. Explain the following in detail (**8** marks each) : [16]

(*a*) Role of serum in cell culture media

(*b*) Types of microscopy.

Or

12. Discuss the following (**8** marks each) : [16]

(*a*) Characterization of animal cells

(*b*) Passaging of cells and its significance.

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-218

S.E. (Biotechnology) (Second Semester) EXAMINATION, 2015

MATERIAL BALANCE AND STOICHIOMETRY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Answer any *three* questions from each Section.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figure to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define the following terms : [8]

(1) Mole

(2) Atomic mass

(3) Molar mass.

How many grams of NH_4Cl are there in 6 mol ?

(*b*) How many moles of K_2CO_3 will contain 156 kgK ? [8]

P.T.O.

Or

2. (*a*) Glycerin, weighing 600 mg is dissolved in pure water to make a final solution of 1 liter. Find the TOC and ThOD of the solution. [8]

(*b*) By Titration, it was found that a sample of water contains hardness equivalent to 500 mg/L (ppm) $CaCO_3$. Assuming that the water contains temporary hardness in 60% $Ca(HCO_3)_2$ form, and 40% $Mg(HCO_3)_2$ form. Find the concentrations of both in water. [8]

3. The analysis of a sample yields 4.6% moisture, 13.7% tannin, 8.4% soluble non-tannin organic matter and the rest lignin. In order to extract tannin out of the sample, a counter-current extraction process is employed. The residue from the extraction process is analysed and found to contain 0.92% tannin and 0.65% solute non-tannin organic matter on a dry basis. Find the percentage of tannin recovered on the basis of the original tannin present in the bark. All analyses are given on mass basis. [16]

Or

4. What are the advantages of recycling operations ? A distillation column separates 10,000 kg/hr of a mixture containing equal mass of benzene and toluene. The product D recovered from the condenser at the top of the column contains 95% benzene, and the bottom W from the column contains 96% toluene. The vapour V entering the condenser from the top of the column is 8000 kg/hr. A portion of the product from the condenser is returned to the column as reflux R, and the rest is withdrawn as the final product D. Assume that V, R and D are identical in composition since V is condensed completely. Find the ratio of the amount refluxed R to the product withdrawn D. [16]

5. The gaseous reaction A = 2B + C takes place isothermally in a constant pressure reactor starting with a mixture of 75% A and 25% inert by volume. In a specified time, the volume doubles. Calculate the % conversion achieved. [18]

Or

6. Pure sulphur is burnt in a burner at the rate of 0.3 kg/s. Fresh dry air is supplied at 303 K and 100 kPa. The gases from the burner contain 16.5% SO_2, 3% O_2 and rest N_2 on SO_3 free volume basis. The gases leave the burner at 1073 K and 101.325 kPa. Calculate :

(*a*) the fraction of sulphur burnt into SO_3.

(*b*) the percentage excess air over the amount required to oxidize the sulphur to SO_2.

(*c*) the volume of dry air in m^3/s and

(*d*) the volume of burner gases in m^3/s. [18]

SECTION II

7. Assume that experimental measurements for a certain organism have shown that cells can convert 2/3rd (w/w) of the substrate carbon hexadecane to biomass. Calculate the stoichiometric coefficients for the following biological reaction : [16]

$$C_{16}H_{34} + aO_2 + bNH_3 \rightarrow c(C_{4.4}H_{7.3}N_{0.86}O_{1.2}) + dH_2O + eCO_2$$

Hexadecane Biomass

Or

8. (*a*) Explain in brief the following terms : [8]

(*i*) Specific heat

(*ii*) Heat capacity

(*iii*) Thermochemistry

(*iv*) Enthalpy.

(*b*) Pure methane is heated from 303 K to 523 K at atmospheric pressure. Calculate the heat added per k-mol methane from the data given below : [8]

	Temp. (298 – 1500 K)
a	19.2499
$b \times 10^3$	52.1135
$c \times 10^6$	11.973
$d \times 10^9$	–11.3173
$e \times 10^{12}$	—

9. A gas mixture containing NO_2, N_2O_4 and N_2 enters the bottom of an absorption tower. Caustic soda solution (containing 23.6% by mass NaOH) is introduced at the top of the column. 50000 m^3/h of a

gas mixture enters having the composition 5.46% NO_2, 2.14% N_2O_4, 0.25% NO and rest N_2 on dry basis. The aqueous solution enters at the rate of 500 L/min. The density of the solution can be taken as 1.25 kg/L. The temperature and pressure of the gas are 295.5 K and 100 kPa respectively. Calculate the composition of the aqueous liquor leaving the column. Assume that the gas mixture leaving the tower contains 0.045 k-mol water vapor per k-mol dry gas mixture. [16]

Or

10. A solid material with 15% by weight of water is dried to 7% by weight of water under the following conditions. Fresh air is mixed with recycled air and is blown over the solid. The fresh air contains 0.01 kg water per kg dry air and the recycled air which is the part of the air leaving the dryer contains 0.1 kg water per kg dry air. The proportions of fresh and recycled air are adjusted so that the mixture entering the dryer contains 0.05 kg water per kg dry air. How many kg water is removed from 100 kg of wet material fed to the dryer ? [16]

11. The coal specified below is burnt with 100% excess air. Calculate : [18]

(*i*) Theoretical O_2 requirement per unit mass of coal

(*ii*) Theoretical dry air required per unit mass of fuel

(*iii*) The wet and Orsat analysis of fuel gases when coal is burnt with 100% excess dry air.

Or

12. (*a*) What is combustion ? Classify fuels. What is calorific value of fuels ? [9]

(*b*) Define and explain in short the following terms : [9]

(*i*) Wet and Orsat analysis of fuel

(*ii*) Proximate and ultimate analysis of coal.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-219

S.E. (Biotechnology) (Second Semester) EXAMINATION, 2015

THERMODYNAMICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What is second law of thermodynamics ? Give the Kelvin-Planck and Clausius statement. [6]

(*b*) State and explain Hess's law in detail. [12]

P.T.O.

Or

2. (*a*) Explain in brief the Carnot's theorems. Draw a Carnot cycle and derive an expression to calculate efficiency of a Carnot engine. [12]

(*b*) State and explain mathematical statement of first law of thermodynamics. [6]

3. For the following reaction the standard heat of reaction at 298 K is –168.987 kJ : [16]

$$CO_2(g) + 4H_2(g) \rightarrow 2H_2O(g) + CH_4(g)$$

The constants in the heat capacity equation :

$$C_P = \alpha + \beta T + \gamma T^2$$

are given below :

	α	β	γ
CO_2	26.75	42.26×10^{-3}	-14.25×10^{-3}
H_2	26.88	4.35×10^{-3}	-0.33×10^{-3}
H_2O	29.16	14.49×10^{-3}	-2.02×10^{-3}
CH_4	13.41	77.03×10^{-3}	-18.74×10^{-3}

Calculate the standard heat of reaction at 893 K.

Or

4. (*a*) Compute the standard heat of formation of methane using the following data : [12]

CH_4 (g) + $2O_2$ (g) → CO_2 (g) + $2H_2O$ (l); ΔH^o_{298K} = –890.35 kJ

H_2 (g) + ½O_2 (g) → H_2O (l); ΔH^o_{298K} = –285.84 kJ

C (graphite) + O_2 (g) → CO_2 (g); ΔH^o_{298K} = –393.51 kJ

(*b*) Write short notes on : [4]

(*i*) Standard heat of formation

(*ii*) Standard heat of combustion.

5. Write a note on Maxwell's equations. Draw mnemonic diagram and explain how Maxwell's equations can be obtained using mnemonic diagram. [16]

Or

6. Write short notes on : [16]

(*a*) Fugacity

(*b*) Fugacity coefficient

(*c*) Activity

(*d*) Activity coefficient.

SECTION II

7. What is Lewis-Randall rule ? Explain Raoult's law and Henry's law for dilute solutions in detail. [16]

Or

8. (*a*) Draw a neat labelled Boiling Point curve. Explain the terms bubble point and dew point. [8]

(*b*) What are the criteria of vapour-liquid equilibrium ? Explain in detail. [8]

9. Derive an expression to show the effect of temperature on the equilibrium constant. [18]

Or

10. (*a*) How is equilibrium constant evaluated ? Explain different methods. [9]

(*b*) For a system in which of the following reaction occurs : [9]

$$CH_4 + H_2O \rightarrow CO + 3H_2$$

Assume there are present initially 2 mol CH_4, 1 mol H_2O, 1 mol CO, and 4 mol H_2. Determine expressions for mole fractions y_i as a function of ε.

11. How can the thermodynamics of biochemical changes be explained with energy yielding and energy requiring biochemical reactions ? [16]

Or

12. (*a*) What is the concept of Gibbs' free energy for bio-changes ? Explain with applications. [8]

(*b*) Explain in brief *two* biological systems where laws of thermodynamics could be applied. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-220

S.E. (Biotechnology) (II Sem.) EXAMINATION, 2015

GENETICS AND MOLECULAR BIOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Solve Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. Explain how Gregor Mendel, the Augustinian Monk's work on pea plants provided the foundation for genetics. [18]

Or

2. Explain Zebra fish as a model genetic organism. [18]

P.T.O.

3. Describe in detail about (**8** marks each) : [16]

(*a*) DNA supercoiling. How is it generated ? What are its biological roles ?

(*b*) Describe the series of Griffith's experiments.

Or

4. Describe the following (**8** marks each) : [16]

(*a*) Pedigree Analysis and its applications.

(*b*) Genes and how do they work.

5. Answer the following (**8** marks each) : [16]

(*a*) Compare and contrast the processes of mitosis and meiosis.

(*b*) Explain the Splicing of introns in pre-*m*RNAs.

Or

6. Answer the following (**8** marks each) : [16]

(*a*) Write a note on DNA organization in eukaryotic cells.

(*b*) Explain the principle underlying the Meselson-Stahl experiment.

SECTION II

7. Describe in detail about (**9** marks each) : [18]

(*a*) An operon is a coordinated unit of gene expression.

(*b*) The properties of the three eukaryotic RNA polymerases and their templates.

Or

8. Answer the following (**9** marks each) : [18]

(*a*) What is Replication fork ? How does the process of replication on one side of a replication fork differ from that on the other ?

(*b*) Discuss process of transcription in prokaryotic cells.

9. Describe in detail about (**8** marks each) : [16]

(*a*) The Genetic Code

(*b*) Molecular Chaperones.

Or

10. Write short notes on (**8** marks each) : [16]

(*a*) Point mutation

(*b*) The process of transcription.

11. Write short notes on (**8** marks each) : [16]

(*a*) The two major forms of Diabetes mellitus

(*b*) Oncogenes.

Or

12. Explain the translation process. [16]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-222

S.E. (Polymer/Petroleum/Petrochemical Engineering)

(First Semester) EXAMINATION, 2015

ENGINEERING CHEMISTRY–I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Attempt *three* question form each Section.

(*ii*) Figures to the right side indicate full marks.

(*iii*) Neat diagram must be drawn wherever necessary.

(*iv*) Assume suitable data wherever necessary.

SECTION I

1. (*a*) What is inductive effect ? Explain +I and –I effect with suitable examples. [6]

(*b*) Define and explain : [6]

(*i*) Huckel rule

(*ii*) Homolysis and Heterolysis

(*c*) Explain why aniline is weaker base than ammonia ? [4]

Or

2. (*a*) Explain phenomenon of hyperconjugation with the suitable examples. [6]

(*b*) Explain structure, stability and reactions of free radical. [6]

(*c*) Explain why phenols are acidic in nature. [4]

P.T.O.

3. (*a*) Explain Aldol condensation with suitable example. [6]

(*b*) Explain S_N1 mechanism with suitable example. [6]

(*c*) Write a short note on Wurtz reaction. [4]

Or

4. (*a*) Explain Beckmann rearrangement with suitable example. [6]

(*b*) Explain use of Grignard reagent for the preparation of alcohols. [6]

(*c*) Explain Kolbe synthesis. [4]

5. (*a*) Explain the following terms with suitable examples : [6]

(*i*) Enantiomers

(*ii*) Distereoisomers.

(*b*) Write a short note on Skraup synthesis of quinoline. [6]

(*c*) Explain Cis-trans isomerism with suitable example. [6]

Or

6. (*a*) Give one method for synthesis of : [6]

(*i*) Pyrrole

(*ii*) Pyridine

(*b*) Explain optical isomerism with suitable example. [6]

(*c*) Explain conformational isomerism shown by ethane. [6]

SECTION II

7. (*a*) State Boyle's law and Avogadro's hypothesis. Deduce them using kinetic gas equation. [6]

(*b*) Explain : [6]

(*i*) Normal boiling point of a liquid.

(*ii*) Normal melting point of a solid.

(*c*) Normal B.P. of benzene is 80°C, while ΔHV for benzene is 30.8 kJ/mole. Find vapour pressure of benzene at 20°C kJ/mole. (R = 8.314 J/mole.K). [4]

Or

8. (*a*) Derive van der Waals' equation of a state for real gases. [6]

(*b*) Explain Andrew's experiment for carbon dioxide. [6]

(*c*) Certain light bulb containing Argon gas at 1.5 atm pressure and 15°C temperature is heated to 80°C at constant volume. Calculate final pressure inside the bulb. [4]

9. (*a*) Define 'batteries'. Give their classification with one example each. [6]

(*b*) Represent Li-ion battery. Give its charging and discharging mechanism. [6]

(*c*) Write advantages and disadvantages of H_2–O_2 fuel cell. [4]

Or

10. (*a*) Write a short note on lead acid battery. [6]

(*b*) What is meant by galvanic cell ? Explain reversible and irreversible cell with proper example. [6]

(*c*) How is fuel cell advantageous over convential fuels ? [4]

11. (*a*) Explain experimental method for determination of osmotic pressure of a liquid. [6]

(*b*) Give any *two* methods for preparation of colloids. Give chemical equation also. [6]

(*c*) Calculate the osmotic pressure of 2.5% solution of cane sugar (sucrose) at 27°C. Find the strength of urea solution which is isotonic with this solution. (Mol.wt. of cane sugar = 342 and urea = 60 and R = 0.082 1 atm K^{-1} mol^{-1}). [6]

Or

12. (*a*) Explain how depression in freezing point is determined experimentally ? [6]

(*b*) What is Raoult's law ? Explain it with the help of graph for ideal solutions. [6]

(*c*) 2.5% solution of $Ca(NO_3)_2$ in water boils at 100.158°C. Molal elevation constant for 1000 g of water is 0.520. Calculate degree of dissociation of $Ca(NO_3)_2$ and Van't Hoff's factor i. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-223

S.E. (Petroleum/Petrochemical/Polymer) (First Semester)

EXAMINATION, 2015

CHEMICAL PROCESS CALCULATIONS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two sections should be written in separate answer books.

(*ii*) Answer any *three* questions from each Section.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right side indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data if necessary.

SECTION I

1. (*a*) In a multiple effect evaporator, the second effect is maintained at 276 torr. Find the absolute pressure in kPa. [8]

(*b*) Convert 2000 W in HP and (kgf.m)/s. [8]

P.T.O.

Or

2. Perform the following conversions : [16]

(*i*) 294 g/l H_2SO_4 to normality

(*ii*) 54.75 g/l HCl to molarity

(*iii*) 4.8 mg/ml $CaCl_2$ to normality

(*iv*) 3 M K_2SO_4 to g/l.

3. For the following operations in chemical industry, draw block diagrams and explain procedure for material balances : [16]

(*i*) Drying

(*ii*) Crystallization.

Or

4. The dilute acid containing 25% H_2SO_4 is concentrated by commercial grade sulphuric acid containing 98% H_2SO_4 to obtain desired acid containing 65% H_2SO_4. Find the quantities of acids required to make 1000 kg of desired acid. [16]

5. A coke is known to contain 90% carbon and 10% non-combustible ash (by weight).

(*i*) How many moles of oxygen are theoretically required to burn 100 kg of coke completely ?

(*ii*) If 50% excess air is supplied, calculate the analysis of gases at the end of the combustion. [18]

Or

6. A combustion chamber is fed with butane and excess air. Combustion of butane is complete. The composition of combustion gases on volume basis is as follows :

CO_2 = 9.39%, H_2O = 11.73%, O_2 = 4.7%, N_2 = 74.18%.

Calculate % excess air used and mole ratio of air to butane used. [18]

SECTION II

7. With labelled diagram, explain in detail on the working of flash column. Note equations involved. [16]

Or

8. Draw algorithm showing various steps involved in determination bubble and dew points of single component systems. [16]

9. A natural gas has the following composition on mole basis : [16]

CH_4 = 84%, C_2H_6 = 13%, N_2 = 3%

Calculate :

(*i*) The heat added to heat 2 kmol. of gas mixture from 311 K to 533 K.

(*ii*) The heat to be added to heat 200 kg of natural gas from 311 K to 533 K.

Given : C_{pm}^{o} values in kJ/kmol.K

Component	C_{pm}^{o} (311–298 K)	C_{pm}^{o} (533–298 K)
CH_4	36.0483	41.7800
C_2H_6	53.5240	67.4954
N_2	29.1317	29.3578

Or

10. Methane gas is heated from 303 K to 523 K at atmospheric pressure. Calculate the heat added per kmol. methane using data given below : [16]

Given : $C_p^o = a + bT + cT^2 + dT^3$, kJ/kmol.K

a	$b \times 10^3$	$c \times 10^6$	$d \times 10^9$
19.2494	52.1135	11.973	–11.3173

11. Calculate the standard heat of reaction at 800 K for the complete combustion of pentane gas (C_5H_{12}). The mean heat capacities of C_5H_{12}, O_2, CO_2 and H_2O are 247, 33.62, 52.32 and 38.49 J/mol.K respectively. The standard heat of combustion at 298 K is –3271.71 kJ/mol. [18]

Or

12. Describe the Hess's law of heat summation. Note in detail the steps involved in calculating enthalpies of mixtures and analyze effect of temperature. [18]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4757]-225

S.E. (Poly/Petro/Petrochem.) (First Semester) EXAMINATION, 2015
STRENGTH OF MATERIALS
(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-book.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Your answers will be valued as a whole.

(*vi*) Use of electronic pocket calculator is allowed.

(*vii*) Assume suitable data if necessary.

SECTION I

1. (*a*) Derive the expression for the elongation of a uniformly tapering bar of length L and of circular cross-section subjected to an axial load. [9]

P.T.O.

(*b*) Derive the expression for maximum stress intensity developed in an axial member subjected to a suddenly applied axial load. [8]

Or

2. (*a*) A 15 mm diameter steel rod passes centrally through a copper tube 50 mm external diameter and 40 mm internal diameter. The tube is closed at each end by rigid plates. If the temperature of the assembly is raised by 60°, calculate the stresses developed in copper and steel.

Take E_S = 210 GPa, E_C = 105 GPa, $\alpha_S = 12 \times 10^{-6}/°C$, $\alpha_C = 17.5 \times 10^{-6}/°C$. [9]

(*b*) A bar 1 m in length is subjected to a pull such that the maximum stress is equal to 150 N/mm^2. Its area of cross-section is 200 mm^2 over a length of 950 mm and 100 mm^2

for 50 mm length (refer Fig. 2(*b*). If E = 200 GPa. Calculate the strain energy stored in the bar. [8]

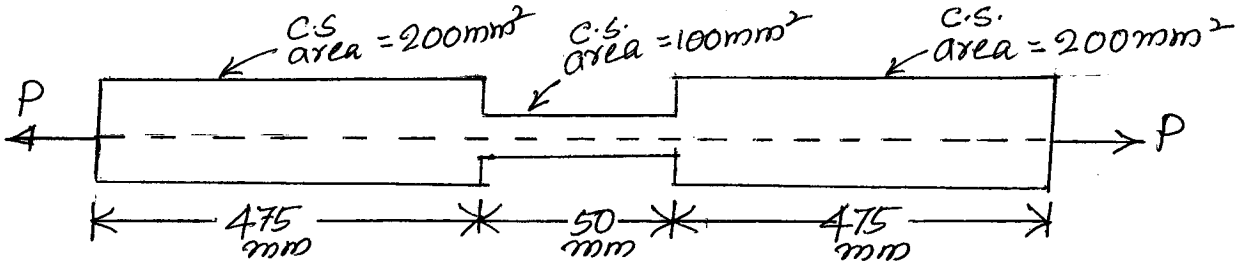


Fig. 2(*b*)

3. (*a*) A hollow shaft of 60 mm outer diameter transmits 180 kW power while rotating at a frequency of 25 Hertz. Find the thickness of the shaft so that the shear stress does not exceed 60 N/mm^2. (Hint : 1 Hertz = 1 revolution/sec). [9]

(*b*) At a point in a piece of elastic material, the normal stress on two mutually perpendicular planes are 80 N/mm^2 (tensile) and 60 N/mm^2 (compressive). These planes also carry shear stresses of 65 N/mm^2. Determine the principal planes and the principal stresses. [8]

Or

4. (*a*) What are the assumptions made in the theory of torsion ? What is torsion formula ? Explain each term. Derive the expression for torsional moment of a hollow shaft in terms of its cross-sectional dimensions. [9]

(*b*) At a point in a strained elastic material, complementary shear stress of intensity q are introduced. Derive the expression for principal stresses and location of principal planes. [8]

5. (*a*) A hollow cylindrical drum of length 3 m, 600 mm in diameter has a thickness of 10 mm. If the drum is subjected to an internal pressure of 3 N/mm^2, find the increase in volume of the drum. E = 200 GPa, ν = 0.3. [8]

(*b*) A thick pipe of 400 mm internal diameter and 100 mm thickness contain a fluid at a pressure of 8 N/mm^2. Find the maximum and minimum hoop stress across the section. Also sketch the radial and hoop stress distribution across the section. [8]

Or

6. (*a*) Derive the expressions for the circumferential and longitudinal stresses developed in a thin cylindrical shell subjected to an internal fluid pressure. [8]

(*b*) A thick spherical shell of 100 mm internal diameter is subjected to an internal fluid pressure of 30 N/mm^2. If the permissible tensile stress of shell material is 80 N/mm^2, find the thickness of the shell. [8]

SECTION II

7. (*a*) Draw the Shear force diagram and Bending moment diagram for the beam shown in Fig. 7.(*a*) showing all important values. [9]

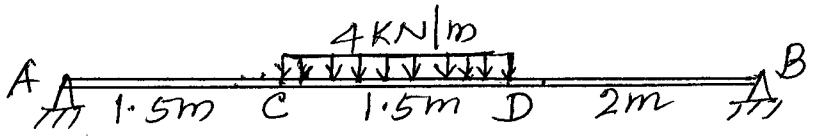


Fig. 7.(*a*)

(*b*) A cast iron test beam 20 mm × 20 mm in section and 1 m long and supported at the ends fails when a concentrated load of 640 N is applied. What uniformly distributed load will break a cantilever of the same material 50 mm wide, 100 mm deep and 2 m long ? [8]

Or

8. (*a*) Draw the Shear force diagram and Bending moment diagram for a simply supported beam carrying a load whose intensity varies uniformly from zero at one end to w per unit run at the other end. [9]

(*b*) A cast iron pipe of internal diameter 450 mm is 15 mm thick and is supported on a span of 8 m. Find the maximum stress in the pipe when it is full of water. Take specific weight of cast iron = 71.6 kN/m^3 and that of water = 9.8 kN/m^3. [8]

9. (*a*) Determine the concentrated load which when placed at the free end of a cantilever of length 1 m would produce a maximum shear stress of 1.5 N/mm^2 anywhere in the cantilever. Assume that the beam has uniform rectangular cross-section 200 mm × 40 mm. [8]

(*b*) Derive the expression for Euler buckling load for a column of length L having hinged ends. [9]

Or

10. (*a*) Explain the terms buckling load, effective length and slenderness ratio with reference to columns. List out the effective length of various types of columns. [8]

(*b*) A beam is triangular in section having a base *b* and an altitude *h*. It is placed with its base horizontal. If at a certain section of the beam, the shear force is S, find the maximum shear stress and the shear stress at neutral axis. [9]

11. (*a*) What is meant by core or kernel of a section with reference to direct and bending stresses ? Find the core of a rectangular section. [8]

(*b*) Find the deflection at the free end of a cantilever carrying a concentrated load at the free end. [8]

Or

12. (*a*) A solid circular shaft is supported on bearings 1 m apart. The shaft transmits 600 kW power at 250 rpm, by belt drive with a pulley located at the middle of the shaft. The belt exerts a total pull of 5 kN. If the permissible shear stress is 55 N/mm^2, find the diameter of the shaft. [8]

(*b*) A horizontal girder of steel having uniform section is 14 m long and is simply supported at its ends. It carries concentrated loads of 120 kN and 80 kN at two points 3 m and 4.5 m from the two ends respectively. If I for the section of the girder is 16×10^8 mm^4 and E_S = 210 kN/mm^2, find the deflection under the 120 kN load. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4757]-226

S.E. (Polymer/Petroleum/Petrochemical Engg.)

(Second Semester) EXAMINATION, 2015

ENGINEERING CHEMISTRY–II

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer Q. **1** *or* Q. **2**, Q. **3** *or* Q. **4**, Q. **5** *or* Q. **6** from Section I and Q. **7** *or* Q. **8**, Q. **9** *or* Q. **10**, Q. **11** *or* Q. **12** from Section II.

(*ii*) Answers to the two sections should be written in separate answer books.

(*iii*) Figures to the right indicate full marks.

SECTION I

1. (*a*) Draw Haworth's projection formula for the following carbohydrates : [6]

(*i*) Maltose

(*ii*) Amylose

(*iii*) Cellulose.

P.T.O.

(*b*) Define 'Enzymes'. Explain *four* factors affecting enzyme activity. [6]

(*c*) Explain secondary structure of proteins. [4]

Or

2. (*a*) Starting from glucose, how will you prepare : [6]

(*i*) Gluconic acid

(*ii*) Sorbitol.

(*b*) Write a note on classification of amino acids. [6]

(*c*) Explain *p*, *h* configuration with respect to benzene. [4]

3. (*a*) Explain synthesis of ester by the following methods : [6]

(*i*) Starting from acid chloride

(*ii*) Starting from diazomethane

(*iii*) Trans-esterification.

(*b*) How will you get aldehyde starting from : [6]

(*i*) acid chloride

(*ii*) alcohol

(*iii*) alkyne ?

(*c*) How is the following conversion carried out ?

carboxylic acid $\rightarrow$ acid chloride $\rightarrow$ amide. [4]

Or

4. (*a*) Give synthesis of primary amine by Gabriel synthesis and reductive amination methods. [6]

(*b*) Explain *three* methods for the synthesis of acid chloride. [6]

(*c*) Explain Friedel-Craft's reaction for the synthesis of ketone. [4]

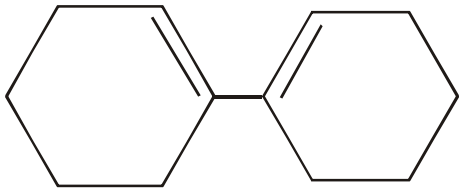
5. (*a*) Define and explain : [6]

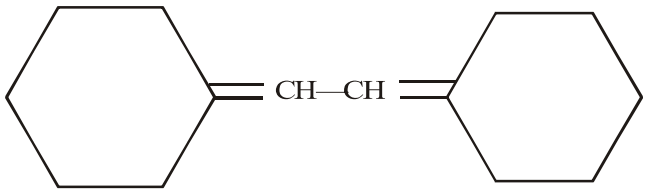
(*i*) Chromophore

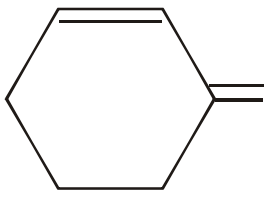
(*ii*) Chemical shift

(*iii*) Auxochrome.

(*b*) Find λ_{max} for the following compounds, using Woodward-Fieser rule : [6]

(*i*) 

(*ii*) 

(*iii*) 

(*c*) State and explain Beer-Lambert's law. [6]

Or

6. (*a*) Using I.R. spectroscopy, how would you detect presence of the following functional groups : [6]

(*i*) Ketone

(*ii*) Aldehyde

(*iii*) Carboxylic acid.

(*b*) How many peaks would you expect in NMR spectrum of the following compounds ? Why ? [6]

(*i*) Methanol

(*ii*) Methane

(*iii*) Acetic acid.

(*c*) Explain principle and applications of IR spectroscopy. [6]

SECTION II

7. (*a*) Explain in brief molecular orbital theory. [6]

(*b*) Define hybridization. Explain types of hybridization and geometry of methane molecule. [6]

(*c*) Explain bonding in CO_2 on the basis of VBT theory. [4]

Or

8. (*a*) With the help of molecular orbital diagram explain magnetic properties of O_2 molecule and calculate its bond order. [6]

(*b*) Give postulate of VBT. Explain structure of water molecule on the basis of VBT. [6]

(*c*) Find the quantum number of last electron of $_{24}Cr$. [4]

9. (*a*) Explain colour and catalytic properties shown by transition metal complexes. [6]

(*b*) $[Ni(CO)_4]$ is tetrahedral but $[Ni(CN)_4]^{2-}$ is square planar and diamagnetic. Explain using VBT. [6]

(*c*) Define and explain ligand and complex ion. [4]

Or

10. (*a*) Calculate the magnetic moment for $[Fe(H_2O)_6]^{2+}$ and $[Fe(CN)_6]^{4-}$ using CFT. [6]

(*b*) Find EAN, O.S. and C.N. of metal ion in the following (any *two*) : [6]

(*i*) $[Cr(CO)_6]$

(*ii*) $[Cu(NH_3)_4Cl_2]$

(*iii*) $[Co(NH_3)_6]Cl_3$.

(*c*) Give postulates of Werner's theory of co-ordination compounds. [4]

11. (*a*) Explain experimental set up for thermogravimetric analysis. [6]

(*b*) Give experimental set up for TLC. Give *two* applications of TLC. [6]

(*c*) Define :

(*i*) atomic radius

(*ii*) ionic radius.

Which will be greater ? Why ? [6]

Or

12. (*a*) Explain the working of atomic absorption spectroscopy (AAS). [6]

(*b*) Explain the term 'chromatography'. Give different types of chromatographic methods on the basis of operating principle. [6]

(*c*) First ionisation potential of an element in periodic table increases with increase in atomic number. Explain. [6]

Atomic number for :

	C	N	O	Cr	Mn	Fe	Co	Ni	Cu
Z =	6	7	8	24	25	26	27	28	29

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-227

S.E. (Petroleum, Petrochemical and Polymer) (Second Semester)

EXAMINATION, 2015

PARTICULATE TECHNOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two sections should be written in separate answer-books.

(*ii*) Answer Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6,** Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** ***or*** Q. No. **12**.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What do you understand by single particle ? Explain the concept in brief. [8]

(*b*) Explain in detail rate of mixing. [8]

Or

2. (*a*) Discuss various types of conveyors used in transportation of solids. [8]

(*b*) Describe in detail flow of solids through hoppers. [8]

P.T.O.

3. (*a*) A material is crushed in Blake Jaw crusher and the average particle size is reduced from 5 cm to 1.3 cm with consumption of 37 Watts-hr/ton. Calculate the energy required to crush the same material with average particle size from 8 cm to 3 cm by using Rittinger's and Kick's laws. Assume mechanical efficiency remains constant. [6]

(*b*) Enlist various size enlargement processes. Explain any *one* in brief. [6]

(*c*) Write a short note on nature of materials to be crushed. [6]

Or

4. (*a*) A certain crusher takes rock whose average particle diameter is 0.025 m and crushes it to a product whose average particle diameter is 0.018 m, at the rate of 20 tons/hour. At this rate, the mill takes 9 HP of power and 0.46 HP power is required to run it empty. [6]

(*i*) What would be the power consumption for same capacity, if average particle diameter in the product is 0.008 m ?

(*ii*) How much power would be required under conditions by Kick's law ?

(*b*) Describe in detail fluid energy mill. [6]

(*c*) Explain with neat sketch the principle, construction and working of Blake jaw crusher. [6]

5. (*a*) A slurry containing 0.2 kg of solid per kg of water is to be thickened to sludge containing 0.7 kg of solid per kg of water in a continuous settling process. With five different concentrations of slurry, the following results were obtained :

Slurry (kg of solid/kg of water)	**Sedimentation Rate** (m/min)
0.2	0.01
0.235	0.0075
0.266	0.006
0.33	0.0042
0.4	0.0030

What should be the minimum area of thickener to effect a separation at rate of 0.625 kg of solid per second ? [8]

(*b*) Explain in detail concept of flocculation. [8]

Or

6. (*a*) Explain with neat sketch construction and working of batch thickener. [8]

(*b*) Write a short note on Kynch's theory of sedimentation. [8]

SECTION II

7. (*a*) Discuss principle and working of spouted bed with neat diagram. [8]

(*b*) Explain the Geldart classification of particles with graphical representation. [4]

(*c*) Discuss in brief different types of fluidization with neat diagram. [4]

Or

8. (*a*) A tube of 0.05 m^2 cross-sectional area is packed with spherical particles up to a height of 0.25 m. The porosity of the bed is 0.35. It is desired to fluidize the particles with water (density = 1000 kg/m^3, viscosity = 10^{-3}). Calculate the minimum velocity of fluidization using Ergan's equation.

Data :

Diameter of particles = 0.01 m,

Density of solid particles = 2600 kg/m^3. [8]

(*b*) Explain with proper sketch, the variations of bed pressure drop with superficial velocity. [8]

9. (*a*) A sample of slurry had previously been tested with a leaf filter of 0.05 m^2 filtering surface giving a pressure difference of 71.3 KN/m^2. The volume of filtrate collected in first 300 seconds was 250 cm^3 and after further 300 seconds an additional 150 cm^3 was collected. Determine the time required to filter out 900 cm^3 of liquid through same filter surface area. [8]

(*b*) Derive the relation for constant rate and constant pressure filtration for the flow of filtrate through cloth and cake resistance combined. [10]

Or

10. (*a*) Derive relationship between thickness of cake and volume of filtrate. [8]

(*b*) Explain in brief : [10]

(*i*) Plate and frame filter press

(*ii*) Pressure leaf filter.

11. (*a*) Explain in detail principle, construction and working of magnetic separator. [8]

(*b*) Estimate the terminal settling velocity for 150 to 230 mesh particles of a limestone whose density is 2800 kg/m^3 falling in water at 30°C.

Data : 150 mesh = 0.104 mm, 230 mesh = 0.063 mm, viscosity = 0.801 cp, density of water = 995.7 kg/m^3. [8]

Or

12. (*a*) Describe in detail with neat diagram the principle, construction and working of cyclone separator with advantages, disadvantages and applications. [8]

(*b*) Write short notes on : [8]

(*i*) Liquid washing equipments

(*ii*) Capacity and effectiveness of screen.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-228

S.E. (Petroleum/Petrochemical/Polymer Engineering)

(Second Semester) EXAMINATION, 2015

HEAT TRANSFER

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Draw neat diagrams wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

(*v*) Use of logarithmic tables, electronic pocket calculators is allowed.

SECTION I

1. (*a*) Explain in detail critical thickness of insulation and its significance. [9]

(*b*) Explain the following : [9]

(*i*) Fourier's law of heat conduction

(*ii*) Newton's law of cooling

(*iii*) Stefan-Boltzmann law of radiation.

P.T.O.

Or

2. (*a*) Derive the necessary expression for the heat conduction through a composite cylindrical pipe made up of five layers of different materials. [10]

(*b*) Which of the following arrangement will give higher heat transfer rate ? [8]

Case (*i*) : 6-fins of 10 cm length

Case (*ii*) : 10-fins of 5 cm length.

Pin fins with insulated ends are provided to increase the heat transfer rate from a hot surface. Thermal conductivity $k_{(\text{fin material})}$ = 300 W/m°C, h = 30 W/m^2 °C, cross-section area of fin = 2 cm^2. Perimeter of fin = 4 cm, Fin base temperature = 330°C and surrounding temperature = 40°C.

3. (*a*) Write a note on Radiation Shield. [8]

(*b*) Discuss the term intensity of Radiation and total emissive power. Prove that the total emissive power of diffuse surface is equal to π times its intensity of radiation. [8]

Or

4. (*a*) Find out the heat transfer rate per unit area due to radiation between two infinitely long parallel planes. The first plane has an emissivity = 0.45 and is at 220°C. The second plane has an emissivity = 0.22 and is at 50°C. A radiation shield having emissivity = 0.55 is introduced between the given planes. Find the percentage reduction in the heat transfer rate. [8]

(*b*) Derive and discuss in detail the necessary expression for the heat exchange between non-black parallel bodies. [8]

5. (*a*) Explain the following dimensionless numbers with their importance : [10]

(*i*) Reynolds number

(*ii*) Prandtl number

(*iii*) Nusselt number

(*iv*) Rayleigh number

(*v*) Grasshoff number.

(*b*) Discuss with *one* example method of dimensional analysis. [6]

Or

6. (*a*) Write a note on heat transfer by natural convection. Differentiate between Natural convection *Vs* Forced convection. [8]

(*b*) Discuss in detail :

(1) Thermal boundary layer

(2) Reynolds analogy. [8]

SECTION II

7. (*a*) Define the term "Logarithmic mean temperature difference". Derive the necessary equation for the LMTD for co-current type heat exchanger. [12]

(*b*) Discuss the following : [6]

Heat exchanger effectiveness and Number of Transfer Units (NTU).

Or

8. (*a*) Define heat exchanger and discuss in brief the classification of the heat exchangers. [12]

(*b*) Write a note on Fouling factor. [6]

9. (*a*) Write a note on film and dropwise condensation. [8]

(*b*) Discuss with neat diagram the following terms :

Nucleate boiling, film boiling, critical heat flux point. [8]

Or

10. (*a*) Discuss the : Pool boiling, forced convection boiling, sub-cooled boiling and saturated boiling. [8]

(*b*) Discuss the effects of the presence of non-condensable gases on condensation. [8]

11. Discuss in detail with neat diagrams the following : [16]

(*i*) Short tube evaporator

(*ii*) Long tube vertical evaporator.

Or

12. (*a*) Explain material balance and energy balance for single effect evaporator with block diagram. [8]

(*b*) Discuss in detail multiple effect evaporators. [8]

Total No. of Questions—**6**] [Total No. of Printed Pages—**3**

Seat No.	

[4757]-229

S.E. (Petro/Petrochem./Poly.) (Second Semester)

EXAMINATION, 2015

ELEMENTS OF SOCIAL SCIENCES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

SECTION I

1. (*a*) Explain Law of Demand. [8]

(*b*) Explain the merits and demerits of Mixed Economies. [8]

Or

(*a*) State and explain different types of Markets. [8]

(*b*) Scarcity of resources is the root cause of Economic Problem. Explain. [8]

P.T.O.

2. (*a*) Explain merits and demerits of specialization and division of labour. [8]

(*b*) Explain the different factors of production. [8]

Or

(*a*) Government plays a vital role in Economic Development. Explain. [8]

(*b*) Explain the functions of Money. [8]

3. Write short notes on : [18]

(*i*) Rationing of Prices

(*ii*) Industrial Policy of India

(*iii*) Law of Diminishing Return.

Or

(*i*) 5 year Plans of Economic Development

(*ii*) Vision of India 2020

(*iii*) LPG model for Economic Development.

SECTION II

4. (*a*) Discuss the impact of Globalization on Indian Society in detail. [10]

(*b*) Explain Modern families in India. [6]

Or

Explain in brief :

(*i*) Cultural Diversity of India. [8]

(*ii*) The importance of Study of Civilizations. [8]

5. (*a*) The entire world is in grief of Religious Fundamentalism. Comment. [8]

(*b*) Sustainable Consumption and Sustainable Development go hand in hand. Explain. [8]

Or

(*a*) Technology leads to Social Change. Explain. [8]

(*b*) Explain the importance of "Census of India". [8]

6. Write short notes on the following : [18]

(*i*) IT Revolution in India

(*ii*) Indian Philosophy

(*iii*) Social Reformers and Reforms.

Or

(*i*) Ecology and Environment

(*ii*) Communalism

(*iii*) Caste System in India.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-232

S.E. (Production/Industrial and Production Sandwich)

(First Semester) EXAMINATION, 2015

HEAT AND FLUID ENGINEERING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data wherever necessary.

SECTION I

1. (*a*) Explain importance of viscosity in fluid motion. What is the effect of temperature on viscosity of liquid and that of air ? [8]

(*b*) Derive an expression for total pressure and center of pressure for an inclined plane immersed in liquid. [8]

P.T.O.

Or

2. (*a*) State and prove Pascal's law. Write its application. [8]

(*b*) What are the different types of pressure measurement devices ? Explain U-tube manometer for positive and negative pressure. [8]

3. (*a*) Derive an expression for discharge through venturimeter. [8]

(*b*) Define and explain the following terms : [8]

(1) Steady flow

(2) Uniform flow

(3) Compressible flow

(4) Laminar flow

Or

4. (*a*) Derive an expression for discharge through circular orifice plate. [8]

(*b*) Derive Bernoulli's equation and write its assumptions. [8]

5. (*a*) What are the different types of losses of energy in pipes ? Write the equation for each loss with neat sketch. [9]

(*b*) Explain with neat sketch constructional details and working of centrifugal pump. [9]

Or

6. (*a*) Explain the following terms : [10]

(1) Froude number

(2) Euler number

(3) Mack number

(4) Dimensional homogeneity

(5) Reynolds number.

(*b*) Explain with neat sketch constructional details and working of Pelton turbine. [8]

SECTION II

7. (*a*) Describe with the neat sketch the working of Cochran boiler, show the position of different mountings and explain the function of each. [8]

(*b*) Define and explain the following properties of lubricants : [8]

(1) Flash point

(2) Fire point

(3) Cloud point

(4) Pour point.

Or

8. (*a*) Write the combustion equation by mass of the following : [8]

(1) For complete combustion of carbon

(2) For incomplete combustion of carbon

(3) For combustion of hydrogen

(4) For combustion of CH_4.

(*b*) Explain the working principle of Babcock and Wilcox Boiler with neat sketch. [8]

9. (*a*) Describe the working of Vapor Compression Refrigeration system with neat sketch. Draw P-h and T-s diagram. [8]

(*b*) Describe and explain the following terms in relation to psychrometry : [8]

(1) Dry bulb temperature

(2) Wet bulb temperature

(3) Dew point temperature

(4) Relative humidity and Specific humidity.

Or

10. (*a*) What are the different types of air conditioning system. Explain the Central Air Conditioning system. [8]

(*b*) Define and state applications of conduction, convection and radiation. [8]

11. (*a*) Derive the relation for volumetric efficiency of reciprocating air compressor with clearance and hence explain the effect of pressure ratio and clearance ratio on it. [9]

(*b*) Draw PV and TS diagram for 2 stage air compressor. Write advantages and disadvantages of multistage compressor. [9]

Or

12. (*a*) Using the T-s diagram, prove that, for the same quantity of heat added, increase of compression ratio increases the thermal efficiency of an Otto-cycle. [8]

(*b*) Explain the following IC engine systems with neat sketch : [10]

(1) Ignition system

(2) Lubrication system.

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4757]-233

S.E. (Production and Production Sandwich)

(I Sem.) EXAMINATION, 2015

STRENGTH ANALYSIS OF MACHINE ELEMENTS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Attempt any *one* question from each Unit of Section I and Section II respectively.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Use of non-programmable electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

UNIT I

1. (*a*) Define stress, strain and elasticity. Derive a relation between stress and strain of an elastic body. [5]

(*b*) What is the principle of superposition ? Explain its uses. [5]

P.T.O.

(*c*) The following data relates to a tensile test conducted on a mild steel bar of diameter 30 mm :

(1) Gauge length = 200 mm,

(2) Extension at a load of 100 kN = 0.139 mm

(3) Load at elastic limit = 230 kN

(4) Maximum load = 360 kN

(5) Total extension = 56 mm

(6) Diameter of the rod at the failure = 22.25 mm.

Calculate :

(*i*) Young's modulus,

(*ii*) The stress at elastic limit,

(*iii*) The percentage elongation and

(*iv*) The percentage decrease in area. [8]

Or

2. (*a*) What is the significance of factor of safety ? How is it determined in different stress conditions ? [5]

(*b*) Derive a relation between modulus of elasticity and modulus of rigidity. [5]

(*c*) A cylindrical bar is 20 mm diameter and 1000 mm long. During a tensile test it is found that the longitudinal stress is 4 times the internal strain. Calculate the modulus of rigidity and the bulk modulus, if its elastic modulus is 1×10^5 N/mm^2. Find the change in volume, when the bar is subjected to a hydrostatic pressure of 100 N/mm^2. [8]

UNIT II

3. (*a*) What is the effect of thermal stresses of a body, when its ends :

(*i*) do not yield and,

(*ii*) yield by a small amount. [8]

(*b*) An overhanging beam of length 6 m carries a triangular load whose intensity varies uniformly from zero at left end to 60 kN/m at the right end. It has one support at 1.5 m from the left and other support at the right end. Draw shear force (S.F.) and bending moment (B.M.) diagrams for the beam. [8]

Or

4. (*a*) A composite bar ABC, rigidly fixed at A and 1 mm above the lower support, is subjected to an axial load of 50 kN at B as shown in the Fig. 1. If the cross-sectional area at the section is 100 square meter and that of section is 200 square meter, find the reactions at both the ends of the bar. Also find the stresses in both the section. Take E = 200 GPa. [8]

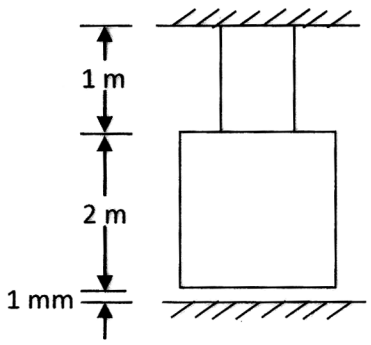


Fig. 1

(*b*) A beam ABCD is fixed at A and D, and hinged at E and F respectively, as shown in Fig. 2. Draw the shear force and bending moment diagrams indicating all important values. [8]

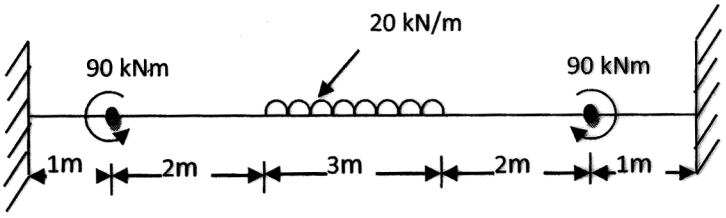


Fig. 2

UNIT III

5. (*a*) Discuss the difference of procedures in finding out the bending stress in :

(*i*) symmetrical section and

(*ii*) an asymmetrical section. [8]

(*b*) A hollow square section with outer and inner dimensions of 50 mm and 40 mm respectively is used as a cantilever span 1 m, how much concentrated load can be applied at the free end of the cantilever, if the maximum bending stress is not to exceed 35 MPa. [8]

Or

6. (*a*) A steel section symmetrical about both the axes as shown in Fig. 3 is subjected to a shear force of 20 kN. Determine the

shear stress at the important points and sketch the shear distribution diagram. [8]

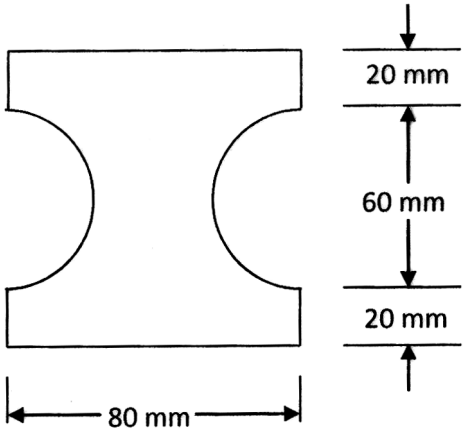


Fig. 3

(*b*) Compare the section modulii of two beams of the same weight and length if the first is a solid circular beam of diameter and the second is a circular tube of outer diameter D1 and inner diameter D2. [8]

SECTION II

UNIT IV

7. (*a*) Explain Mohr's circle method for stresses on an oblique section of a body subjected to direct stresses in two mutually perpendicular directions accompanied by a simple shear stress. [8]

(*b*) A steel rod of 28 mm diameter is 2.5 m long. Find the maximum instantaneous stress and work done at maximum elongation,

when the maximum load of 50 kN is suddenly applied to it. Also calculate maximum dynamic force in the rod. Take E = 200 GPa. [10]

Or

8. (*a*) The stresses at a point in a component are 100 MPa (tensile) and 50 MPa (compressive). Determine the magnitude of the normal and shear stresses on a plane inclined at an angle of 25° with tensile stress. Also determine the direction of the resultant stress and the magnitude of the maximum intensity of shear stress. [10]

(*b*) Show that in a bar, subjected to an axial load, the instantaneous stress due to sudden application of a load is twice the stress caused by the gradual application of load. [8]

UNIT V

9. (*a*) Derive an expression for the angle of twist in the case of a member of circular cross-section subjected to torsional moment. [8]

(*b*) A cylindrical vessel 2 m long and 500 mm in diameter with 10 mm thick plates is subjected to an internal pressure of 3 MPa. Calculate the change in volume of the vessel. Take E = 200 GPa and Poisson's ratio = 0.3 for the vessel material. [8]

Or

10. (*a*) A solid aluminum shaft 1 m long and 50 mm diameter is to be replaced by a hollow shaft of the same length and same outside diameter, so that the hollow shaft could carry the same torque and has the same angle of twist. What must be the inner diameter of the hollow shaft ? [8]

(*b*) What would be the change in volume δV, if a thin spherical shell is subjected to an internal pressure p. [8]

UNIT VI

11. (*a*) For a beam subjected to bending moment, prove :

$$y = \frac{M l^2}{8EI}$$

where l = length of beam, M = bending moment, E = Modulus of elasticity of beam material, and I = moment of inertia of beam section. [8]

(*b*) A straight cylinder bar of 10 mm diameter and 1.5 m long is freely supported at its two ends in a horizontal position. It is loaded with a concentrated load of 150 N at the center when the center deflection is observed to be 6 mm. If placed in the vertical position and loaded vertically, what load would cause it to buckle ? Also find the ratio of the maximum stress in the two cases. [8]

Or

12. (*a*) A simply supported beam has a span of 15 m and carries two point loads of 4 kN and 9 kN at 6 m and 10 m respectively, from one end. Find the deflection under each load and the maximum deflection. E = 200 GPa and I = 400 × 106 mm^4. [8]

(*b*) Explain slenderness ratio. Give limitations of Euler's formula. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-234

S.E. (Production/Industrial) (First Semester)

EXAMINATION, 2015

MACHINE TOOL OPERATIONS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12.**

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

SECTION I

Unit I

1. (*a*) Explain apron mechanism used in lathe machine with suitable sketches. [10]

(*b*) Explain geometry of single point turning tool with suitable sketches. [8]

Or

2. (*a*) Explain working of half nut mechanism with a suitable sketch. [6]

(*b*) Explain taper turning by form tool with suitable sketches. [6]

(*c*) The pitch of leadscrew is 20 mm, and the pitch of the thread to be cut is 5 mm. Find the change gears and draw a suitable sketch of gear train. [6]

P.T.O.

Unit II

3. (*a*) Explain geometry of drill with suitable skletches. [8]

(*b*) Explain working of sensitive drilling machine with suitable sketch. [8]

Or

4. (*a*) Explain different types of taps with suitable sketches. [8]

(*b*) List various types of boring machines and explain any *one* with suitable sketch. [8]

Unit III

5. (*a*) Explain working of column and knee type milling machine with sketch. [8]

(*b*) Explain methods of indexing. [8]

Or

6. (*a*) Explain any *four* types of milling cutters with suitable sketches. [8]

(*b*) Calculate indexing for 60 divisions, Hole circles available are : [8]

Plate I—15, 16, 17, 18, 19, 20

Plate II—21, 23, 27, 29, 31, 33

Plate III—37, 39, 41, 43, 47, 49.

SECTION II

Unit IV

7. (*a*) Explain working of crank and slotted link mechanism used in shaper with suitable sketch. [10]

(*b*) Explain working open and cross belt drive mechanism used in planer with suitable sketch. [8]

Or

8. (*a*) Explain Whitworth quick return mechanism used in shaper with suitable sketch. [10]

(*b*) Explain geometry of broaching tool with a suitable sketch and explain the importance of each element. [8]

Unit V

9. (*a*) Discuss types of bonds used in grinding wheels. [8]

(*b*) Explain meaning of grit, grade and structure of grinding wheel. [8]

Or

10. (*a*) Explain internal centreless grinding with a suitable sketch. [8]

(*b*) Explain mounting of grinding wheel a with suitable sketch. [8]

Unit VI

11. (*a*) Explain honing with suitable sketches. [8]

(*b*) Explain : [8]

(*i*) Polishing

(*ii*) Metal spraying

(*iii*) Electroplating.

Or

12. Write short notes on the following : [16]

(*i*) Superfinishing

(*ii*) Buffing

(*iii*) Lapping.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-236

S.E. (Prod./Indus.) (First Semester) EXAMINATION, 2015

MATERIAL SCIENCE

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section I and Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section II.

(*ii*) Answers to the two Sections must be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

SECTION I

1. (*a*) What is mechanical working ? What role is played by the dislocations in the process of cold working ? [6]

(*b*) Show the following planes : [4]

(122), (201), (100), (220)

(*c*) Compare edge dislocation and screw dislocations with suitable sketches. [8]

P.T.O.

Or

2. (*a*) What is the importance of engineering materials for a production engineer ? Classify the materials mentioning a few applications. [8]

(*b*) What is plastic deformation ? Write in brief about the twinning. [5]

(*c*) Show the effect of cold working and annealing on the properties of mild steel by making suitable diagram. [5]

3. (*a*) Compare Vicker and Poldi hardness methods. (Process, advantages, applications) [8]

(*b*) Show the following Stress-Strain curves for : [8]

(*i*) Al

(*ii*) Cast iron

(*iii*) Mild Steel

(*iv*) Polymer.

Or

4. (*a*) Write short notes on : [8]

(*i*) Tensile test

(*ii*) Brinell test.

(*b*) Discuss in detail about the following tests : [8]

(*i*) Radiography test

(*ii*) Ultrasonic test.

5. (*a*) What do you understand by the isomorphous system ? Explain with suitable diagram. [4]

(*b*) Define the following : [12]

(*i*) Lever rule

(*ii*) Phase

(*iii*) Equilibrium cooling

(*iv*) System

(*v*) Tie line rule

(*vi*) Components.

Or

6. (*a*) Make the equilibrium dig. for a eutectic system with the details of phases in each zone. Show the transformation of phases in a hypereutectic alloy right from liquid state to solid state upto room temp. [10]

(*b*) What is the effect of non-equilibrium cooling on the transformation and mech. properties ? [6]

SECTION II

7. (*a*) Write in brief about the effect of solid solution hardening and refining of grain size on the strength of the materials. [8]

(*b*) Why temp. of sun cannot be measured by total radiation pyrometer ? Discuss about the process of measuring temp. with this pyrometer. [8]

Or

8. (*a*) Discuss about the age hardening. How is it helpful in manufacturing Al alloy products with improved properties. [8]

(*b*) What is the working principle of Thermocouple ? Explain in detail with diagram. [8]

9. (*a*) Write in brief about the following : [8]

(*i*) Powder characteristics

(*ii*) Sintering.

(*b*) Show the manufacturing of refractory metal-non-metal powder component with the help of a flow chart. [8]

Or

10. (*a*) What do you understand by the term powder conditioning ? Why is it done ? [8]

(*b*) Which are the different processes of powder manufacturing ? What precautions one should take to manufacture powders of Mg like material ? [8]

11. (*a*) Show, how the corrosion may take place in any engg. component due to the faulty design and fabrication. How can we avoid it ? [10]

(*b*) Compare IVD and PVD. [8]

Or

12. (*a*) Explain the process of chemical vapour deposition with suitable sketch. [10]

(*b*) Compare erosion corrosion and cavitation corrosion. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+2**

Seat No.	

[4757]-237

S.E. (Production/Production S/W) (Second Semester)

EXAMINATION, 2015

DESIGN OF MACHINE ELEMENTS

(2008 Pattern)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

Section I

1. (*a*) Explain direct and bending stresses with example. [4]

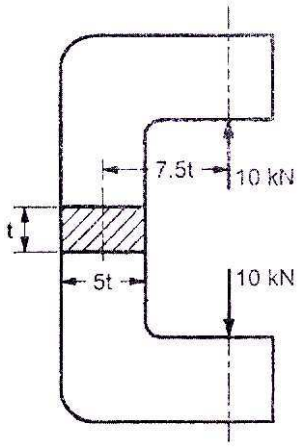
P.T.O.

(*b*) Explain what do you understand by : [6]

(*i*) Service factor

(*ii*) Factor of safety.

(*c*) A 'C' frame subjected to a load of 10 kN is shown in Fig. 1. It is made of gray cast iron with allowable stress of 120 N/mm^2. Determine the dimensions of the cross-section of frame. [8]



(All dimensions are in mm)

Fig. 1

Or

2. (*a*) Explain the difference between bearing stress and crushing stress with suitable example. [6]

(*b*) A bell crank lever is to be design to raise a load of 5 kN at the short arm end. The arm lengths are 150 mm and 500 mm. The permissible stresses for lever and pin materials in shear and tension are 60 N/mm^2 and 90 N/mm^2 respectively. The bearing pressure on the pin is to be limited to 12 N/mm^2. Assume the lever cross-section as $t \times 4t$ (t-thickness of lever in mm) and fulcrum pin length as 1.25 times pin diameter. [12]

3. A protected type rigid flange coupling is used to transmit 25 kW power at 500 rpm from an engine to a machine. Design a coupling for overload capacity of 25%. Assume the following permissible stress for the components of coupling. [16]

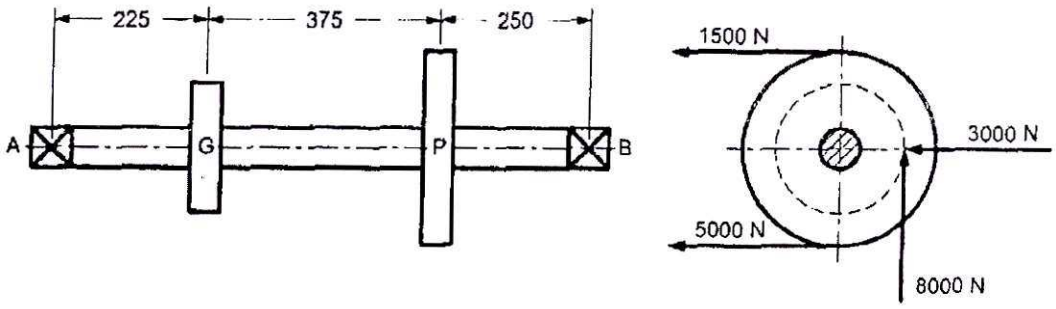
Assume number of bolts as 6.

	C.I. (Flange)	**MS (shaft and key)**	**Plain carbon steel (bolt)**
Allowable tensile stress, N/mm^2	20	60	60
Allowable shear stress, N/mm^2	12	35	28
Allowable compressive stress, N/mm^2	60	60	60

Or

4. A pulley weighing 1.2 kN and 500 mm diameter is driven by a horizontal belt drive. The power is transmitted through a solid shaft to a pinion keyed to the shaft which in turn meshes with a gear. The belt tension and a component of gear reactions on the pinion are as shown in Fig. 2. The allowable shear stress for the shaft and key material is 55 N/mm^2. Design the shaft and square key. Assume shaft and key are made of the same material. The shock and fatigue factors are : K_b = 2.0 and K_t = 1.5 [16]

Also find the torsional deflection of the shaft.



(All dimensions are in mm)

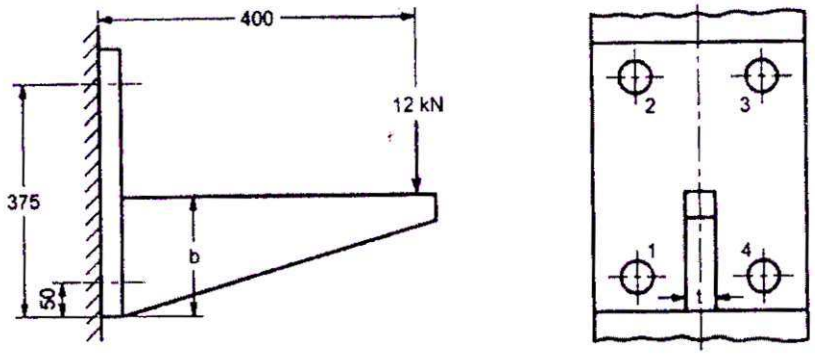
Fig. 2

5. (*a*) Sketch the profile of ISO metric threads and main dimensions. [4]

(*b*) A bracket, shown in Fig. 3, is fixed to a steel column by using 4 bolts. A load of 12 kN acts on the bracket at a distance of 400 mm from the face of the column. The permissible tensile stress for the bolt and bracket material is 84 N/mm^2. The b/t ratio for the cross-section of the arm of the bracket is 45. Determine : [12]

(*i*) The size of the bolts and

(*ii*) The cross-section of the arm of bracket.



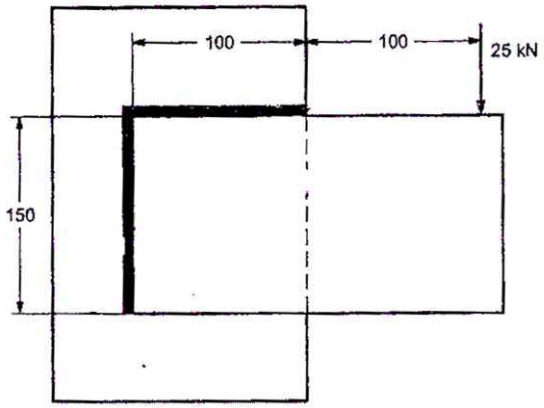
(All dimensions are in mm)

Fig. 3

Or

6. (*a*) State the advantages and limitation of the welded joints. [4]

(*b*) Fig. 4 shows a welded joint subjected to an eccentric load of 25 kN. The welding is only on one side. If the permissible shear stress for the weld material is 55 MPa, determine the weld size. [12]



(All dimensions are in mm)

Fig. 4

Section II

7. (*a*) Compare square and trapezoidal thread with relevant sketches. [4]

(*b*) A 26 × 5 square threaded, single start power screw is used to support a load of 12 kN. The effective diameter of the collar

is 46 mm and the coefficient of friction is 0.15. The nut is made of phosphor bronze having 0.12 as coefficient of friction and 6 MPa as allowable bearing pressure. The length of the handle is 300 mm. Calculate : [12]

(1) The force required to raise the load

(2) The force required to lower the load

(3) The yield strength of material for a factor safety of 4

(4) The overall efficiency of the screw and

(5) The number of threads in nut.

Or

8. (*a*) What do you mean by screw efficiency and overall efficiency ? Explain the variation of screw efficiency with respect to lead angle. [6]

(*b*) A double start square threaded vertical power screw with a mean diameter of 120 mm and a pitch of 18 mm supports a load of 20 kN. The screw passes through the boss of a spur gear which acts as a nut. The gear having 85 teeth meshes with pinion of 17 teeth. The mechanical efficiency of gear pair is 95%. The axial

thrust on the screw is taken by a collar bearing of 250 mm outside diameter and 100 mm inside diameter. The coefficient of friction between screw and nut is 0.12 and that for collar bearing is 0.15. The allowable bearing pressure is 1.5 MPa. Find : [10]

(*i*) Torque to be applied at pinion shaft

(*ii*) Height of nut

9. (*a*) What is surge in springs ? What remedial measures you will suggest to avoid it ? [4]

(*b*) A loaded narrow gauge rail car weighing 2000 kg mass and moving at 4.32 km/hr velocity is brought to rest by a bumper consisting of two helical compression springs of spring index 6. In bringing rail car to rest, both the bumper springs get compressed by 140 mm. The spring steel has permissible shear stress of 400 N/mm^2 and modulus of rigidity of 8.4×10^4 N/mm^2. [12]

Determine :

(*i*) maximum load on each spring

(*ii*) diameter of spring wire

(*iii*) mean oil diameter

(*iv*) total number of coil

(*v*) solid length

(*vi*) free length

Or

10. (*a*) Explain various types of spring and their applications. [4]

(*b*) Design a helical spring for Ramsbottom safety valve with the following data : [12]

Diameter of valve = 100 mm

Operating pressure = 1 N/mm^2

Maximum lift = 6 mm at 10% pressure rises over operating pressure

Allowable shear strength for spring material = 450 kN/mm^2

Modulus of rigidity for spring material = 83×10^3 kN/mm^2

Spring index = 6

11. (*a*) Write short notes on : [6]

(1) Morgan's color code

(2) DFM

(*b*) Explain the role of the following aspects in the aesthetic design : [6]

(1) Proportion

(2) Impression and purpose

(3) Continuity

(*c*) Define the ergonomics in design and state its objectives. [6]

Or

12. (*a*) What is Design for Assembly ? Explain the general principles to be followed while designing the parts for assembly. [8]

(*b*) Describe the various guidelines to be followed in design of the parts for the following process : [10]

(1) Welding

(2) Forging

(3) Machining.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-238

S.E. (Production) (Second Semester) EXAMINATION, 2015

WELDING AND FOUNDRY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I.

(*ii*) Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

(*vi*) Use of electronic pocket calculator and logarithmic tables is allowed.

SECTION I

1. (*a*) Describe with neat sketch Submerged Arc Welding (SAW) process and its applications. [10]

P.T.O.

(*b*) Explain Volt-Ampere (V–A) and Volt-Arc Length (V–L) characteristics in welding with neat sketch. [8]

Or

2. (*a*) Explain Gas Tungsten Arc Welding (GTAW) process considering the following points : [10]

(*i*) Working principle

(*ii*) Process parameters

(*iii*) Advantages

(*iv*) Disadvantages

(*v*) Applications.

(*b*) Explain with neat sketch an arc blow in the welding ? Also explain causes, effects and remedies arc blow. [8]

3. (*a*) Compare leftwards and rightwards gas welding technique with neat sketch. [6]

(*b*) Explain with neat sketch spot welding along with advantages, disadvantages and applications. [6]

(*c*) List out various filler metals and fluxes used in gas welding. [4]

Or

4. (*a*) Describe the process of Oxy-fuel gas cutting. What do you understand by the term kerf and drag in gas cutting ? [6]

(*b*) Describe with neat sketch projection welding process along with advantages, disadvantages and applications. [6]

(*c*) Distinguish with suitable sketches the different types of oxy-acetylene gas flames. [4]

5. (*a*) Explain with neat sketch thermit welding along with its advantages, disadvantages and applications. [6]

(*b*) Compare electron beam welding with laser beam welding. [6]

(*c*) Write a short not on calculation of welding cost. [4]

Or

6. (*a*) Compare soldering and brazing. What are the functions of fluxes and filler metal used in both ? [6]

(*b*) Explain ultrasonic welding with its advantages, disadvantages and applications. [6]

(*c*) Write a short note on : Inspection and testing of weld. [4]

SECTION II

7. (*a*) With neat sketch explain the construction and operation of a Cupola furnace. [10]

(*b*) Explain in detail various allowances given to the patterns. [6]

Or

8. (*a*) Explain with neat sketch different types of patterns. List out various pattern materials. [8]

(*b*) List out various tests performed on moulding sand. Write the procedure for permeability test of moulding sand. [8]

9. (*a*) Explain with neat sketch pressure die casting process. List out merits, demerits and applications of it. [8]

(*b*) Write short notes :

(*i*) Foundary mechanisation

(*ii*) Investment casting. [8]

Or

10. (*a*) What are the common defects in the casting ? State their causes and remedies. [8]

(*b*) Differentiate between Hot chamber and Cold chamber die casting. [8]

11. (*a*) Define gating ratio. Explain pressurized and un-pressurized gating system. State the standard gating ratios used in practice for Aluminium Steel and Brass. [8]

(*b*) Explain the following : [10]

(*i*) Casting yield and methods to increase it

(*ii*) Various components of gating system and their functions.

Or

12. (*a*) What is meant by directional and progressive solidification of casting ? Explain this with neat sketch. [7]

(*b*) Using Caine's method calculate the size of cylindrical riser (Height = Diameter) necessary to feed steel slab casting 50 × 50 × 10 cm. with side riser, casting is poured horizontally into the mould. Data for steel casting a = 0.1, b = 0.03 and c = 1.0. [7]

(*c*) Explain Chvorinov's rule. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4757]-239

S.E. (Production/Industrial/Production S/W) (Second Semester)

EXAMINATION, 2015

THEORY OF MACHINES

(2008 PATTERN)

Time : Four Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of non-programmable electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define and explain the term kinematic chain. For a kinematic chain, what is the relation between number of pairs and number of links ? Also write the equation, showing the relation between number of links and number of joints. [7]

P.T.O.

(*b*) Differentiate between : [4]

(*i*) Lower pair and Higher pair

(*ii*) Closed pair and Unclosed pair.

(*c*) Write a short note on the classification of kinematic pairs. [5]

Or

2. (*a*) What do you mean by constrained motion ? What are the different types of constrained motions ? Explain each type with examples and neat sketches. [8]

(*b*) Define and explain the terms : [4]

(*i*) Binary joint

(*ii*) Ternary joint

(*iii*) Quaternary joint.

(*c*) Differentiate between Machine and Mechanism. [4]

3. (*a*) What is the importance of finding accelerations of various points in a mechanism ? Name the *two* different methods of finding acceleration in a mechanism. [6]

(*b*) How will you find the direction of Coriolis component of acceleration ? [4]

(*c*) The length crank and connecting rod of a vertical reciprocating engine are 150 mm and 750 mm respectively. The crank is rotating at 400 rpm clockwise. Find analytically :

(*i*) Acceleration of piston

(*ii*) Velocity of piston

(*iii*) Angular acceleration of the connecting rod when the crank has turned through 40° from the top dead centre and piston is moving downwards. [8]

Or

4. (*a*) The crank of a reciprocating engine is rotating in clockwise direction with a constant angular velocity of 30 rad/s. The length of crank and connecting rod are 200 mm and 750 mm respectively. Using Klein's construction, find :

(*i*) Velocity of piston

(*ii*) Velocity of midpoint of connecting rod

(*iii*) Angular velocity of connecting rod

(*iv*) Acceleration of piston

(*v*) Angular acceleration of connecting rod when crank has turned through 30° from inner dead centre. [12]

(*b*) A rigid link AB is rotating anticlockwise about point A with angular velocity 'ω' and angular acceleration 'α'. Describe the method of drawing the acceleration diagram and find the total acceleration of B w.r. to A. [6]

5. (*a*) Discuss the effect of the following parameters on the wear rate : [8]

(*i*) Load

(*ii*) Temperature

(*iii*) Surface films

(*iv*) Compatibility

(*v*) Crystal structure.

(*b*) Discuss Tribology and the different array covered under Tribology. [6]

(*c*) Define the term limiting angle of friction and coefficient of friction. [2]

Or

6. (*a*) Explain the desirable properties of lubricating oil. [6]

(*b*) Write short notes on (any *two*) : [10]

(*i*) Archad's theory of Adhesive wear

(*ii*) Erosive wear

(*iii*) Surface fatigue wear.

SECTION II

7. (*a*) A 100 mm wide and 10 mm thick belt transmits 5 kW of power between two parallel shafts. The distance between the shaft centres is 1.5 m and the diameter of the smaller pulley is 440 mm. The driving and the driven shafts rotate at 60 rpm and 150 rpm respectively. The coefficient of friction is 0.22. Find the stress in the belt if the two pulleys are connected by : [10]

(*i*) an open belt and

(*ii*) a cross belt.

Take $\mu = 0.22$.

(*b*) Derive the relation :

$$\frac{T_1}{T_2} = e^{\mu\theta}$$

for a flat-belt drive with usual notation. [6]

Or

8. (*a*) What is the effect of centrifugal tension on the power transmitted ? [4]

(*b*) What is meant by initial tension in a belt drive ? [3]

(*c*) Derive the condition for maximum power transmission by a belt drive considering the effect of contrifugal tension. [7]

(*d*) Name the material of the belts, V-belts and ropes. [2]

9. (*a*) What is meant by a self-locking and a self-energised brake ? [5]

(*b*) Discuss the effectiveness of a band brake under various conditions. [4]

(*c*) In a belt transmission dynamometer, the driving pulley rotates at 300 rpm. The distance between the centre of the driving pulley and the dead mass is 800 mm. The diameter of each of the driving as well as the intermediate pulleys is equal to 360 mm. Find the value of the dead mass required to maintain the lever in a horizontal position when the power transmitted is 3 kW. Also, find the value when the belt just begins to slip on the driving pulley, μ being 0.25 and the maximum tension in the belt 1200 N. [7]

Or

10. (*a*) What are various types of brakes ? Describe briefly. [6]

(*b*) What are the advantages of a self-expanding shoe brake ? Derive the relation for the friction torque for such brake. [6]

(*c*) Describe with the help of a neat sketch the construction and working of a prony brake absorption dynamometer. [4]

11. (*a*) When and why is the correction couple applied while considering the inertia of the connecting rod of a reciprocating engine ? [6]

(*b*) What do you mean by Dynamical Equivalent System ? Explain. [8]

(*c*) What is meant by piston effort and crank effort ? [4]

Or

12. (*a*) The following data relate to the connecting rod of a reciprocating engine : [14]

Mass = 50 kg

Distance between bearing centres = 900 mm

Diameter of big end bearing = 100 mm

Diameter of small end bearing = 80 mm

The time of oscillation when the connecting rod is suspended from big end = 1.7 sec

small end = 1.85 sec.

Determine the :

(*i*) Radius of gyration K of the rod about an axis through centre of mass perpendicular to the plane of oscillation

(*ii*) Moment of inertia of the rod about the same axis and

(*iii*) Dynamically equivalent system of the connecting rod comprising two masses, one at the small end-bearing centre.

(*b*) In what way is the inertia of the connecting rod of a reciprocating engine taken into account ? [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-240

S.E. (Production/Industrial Engineering) (II Sem.) EXAMINATION, 2015

INDUSTRIAL ORGANISATION AND MANAGEMENT

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define Management. Explain functions of management. [8]

(*b*) Define organization and explain its principles. [8]

Or

2. (*a*) Explain the characteristics and objectives of management. [8]

(*b*) Explain line organization with its benefits and limitations. Why is it also called as military organization ? [8]

P.T.O.

3. (*a*) Discuss the nature of group dynamics which prevail in informal organization and its impact on individual and organizational effectiveness as a whole. [9]

(*b*) Define leadership. Discuss trait theory of leadership. What are its limitations ? [9]

Or

4. (*a*) Explain Maslow's theory of Need Hierarchy and relate it to Alderfer's ERG theory. What are the similarities and differences ? [9]

(*b*) Define group dynamics. How will you define group ? Why people join groups ? [9]

5. (*a*) What are the essential qualities of an entrepreneur ? What are different factors contributing to failure of entrepreneurial ventures ? [8]

(*b*) Who is a venture capitalist ? What different kinds of support and help is offered by them and what are their expectations from an entrepreneur ? [8]

Or

6. (*a*) Discuss how government supports various entrepreneurial activities in India. [8]

(*b*) Define entrepreneurship. What are various growth strategies available to an entrepreneur ? [8]

SECTION II

7. (*a*) What are the benefits of market research ? How is market research conducted ? [8]

(*b*) What is customer equity ? How can a company increase its customer equity ? [8]

Or

8. (*a*) Define sales promotion. What are the various sales promotion tools ? [8]

(*b*) What is the importance of knowing buyer behaviour ? Discuss the major factors that influence the buyer behaviour. [8]

9. (*a*) Explain the importance of training to a worker. What are various types of training ? [8]

(*b*) What do you mean by labour turnover ? What are its causes ? Suggest the steps to reduce labour turnover. [8]

Or

10. (*a*) Enumerate various methods of imparting training to employees. Discuss in detail any *two* methods. [8]

(*b*) Define Human Resource Management. What are most important functions of Human Resource Management ? [8]

11. (*a*) Define the term worker and discuss briefly the provisions relating to safety of workers under Factories Act, 1948. [9]

(*b*) Explain the following in relation to job evaluation : [9]

(*i*) Job analysis

(*ii*) Job description

(*iii*) Job specification

(*iv*) Job classification.

Or

12. (*a*) What is an industrial dispute ? Differentiate between "closure" and "lock out". What steps are necessary at time of closure of an industry ? [9]

(*b*) Define wage. Discuss factors affecting wages. Explain any *one* wage payment plan with its merits and demerits. [9]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4757]-244

S.E. (Production S/W) (First Semester) EXAMINATION, 2015

MANUFACTURING PROCESSES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Answer *three* questions from each Section.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain with neat sketch the procedure to be followed for making a sand mould. [10]

(*b*) What is pattern ? Describe different allowances provided on pattern in short. [8]

Or

2. (*a*) Describe the Shell Moulding process with neat sketch. Also state its advantages, limitations and applications. [9]

P.T.O.

(*b*) Make a neat cross-sectional sketch of a cupola indicating its various zones and describe the following : [9]

(*i*) Its construction

(*ii*) Its different zones and their functions.

3. (*a*) Explain what do you understand by forging ? Explain with neat sketches the following operations : [8]

(*i*) Upsetting

(*ii*) Fullering

(*iii*) Bending.

(*b*) Explain continuous rolling mill with neat sketch. What are its advantages ? [8]

Or

4. (*a*) Explain 'Mechanical Working' of metals. Compare hot working with cold working. [8]

(*b*) Write short notes on : [8]

(*i*) Swaging process

(*ii*) Indirect extrusion.

5. (*a*) Describe the 'Thermit Welding' process with suitable diagram and also mention field of applications. [8]

(*b*) Describe the 'Electron beam welding' with neat sketch stating its advantages, disadvantages and area of applications. [8]

Or

6. (*a*) Explain with neat sketch 'Submerged Arc Welding' process stating advantges, limitations and area of applications. [8]

(*b*) Differentiate between the following processes : [8]

(*i*) Forehand and backhand gas welding techniques

(*ii*) Spot welding and seam welding.

SECTION II

7. (*a*) Sketch and describe the 'Head Stock' of lathe. [8]

(*b*) Sketch and describe in short : [4]

(*i*) Follower rest

(*ii*) Lathe centres.

(*c*) Draw neat well labelled diagram of the following : [6]

(*i*) Thread cutting setup on lathe.

(*ii*) Back geared headstock of lathe.

Or

8. (*a*) Explain the following operations performed on lathe with the help of simple sketch : [9]

(*i*) Eccentric turning

(*ii*) Facing

(*iii*) Parting off.

(*b*) Draw three views of single cutting point tool and label it. [6]

(*c*) Draw only sketch of 'Drilling Operation' on lathe. [3]

9. (*a*) Index 87 division by compound indexing method. The hole circle available are : [8]

Plate I : 15, 16, 17, 18, 19, 20

Plate II : 21, 23, 27, 29, 31, 33

Plate III : 37, 39, 41, 43, 47, 49.

(*b*) Draw neat sketch of a twist drill and show its elements, also explain the following terms in short : [8]

(*i*) Flank

(*ii*) Flutes

(*iii*) Web.

Or

10. (*a*) Describe the various types of milling cutter with neat sketches (any *four*). [8]

(*b*) Explain the following drilling operations on drilling machine with sketch : [8]

(*i*) Spot facing

(*ii*) Countersinking

(*iii*) Counterboring

(*iv*) Trepanning.

11. (*a*) The following letters are printed on a new grinding wheel, [4]

W-C-500-H-4-V-17

Describe the meaning of any *four* letters (Except first and last letters) mention in the above specification of grinding wheel.

(*b*) With reference to grinding explain : [6]

(*i*) Wheel speed

(*ii*) Work speed

(*iii*) Depth of cut.

(*c*) What do you understand by "Grain, Grit and Structure" of grinding wheel ? [6]

Or

12. (*a*) What is centreless grinding ? Draw a working set of centreless external grinding process and explain in short. [8]

(*b*) What is meant by honing ? Write down application, merits and demerits of honing process. [8]

Total No. of Questions—**6**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4757]-248

S.E. (Production S/W) (Second Semester) EXAMINATION, 2015

MANUFACTURING ENGINEERING AND METROLOGY PRACTICES

(2008 Pattern)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*iv*) Assume suitable data, if necessary.

(*v*) *All* questions are compulsory.

Section I

1. (*a*) A tubing of 40 mm outer diameter is turned on a lathe, at a cutting speed of 15 m/min and feed 0.2 mm/rev. Rake angle of tool is 20^{o}. The cutting force is 800 N and feed force is 350 N.

P.T.O.

The length of continuous chip in one revolution is 80 mm. Calculate. [10]

(1) Coefficient of friction

(2) Chip thickness ratio

(3) Shear plane angle

(4) Shear flow speed

(5) Shear strain rate

(*b*) Write short notes on (any *two*) : [6]

(1) Single point cutting tool

(2) Types of chips

(3) Tool wear

Or

(*a*) Draw and explain resolution of resultant cutting force developed by Emst & Merchant Theory. [8]

(*b*) Explain in detail : [8]

(1) Methods of machining

(2) Tool wear types.

2. (*a*) Explain with the help of neat sketch, what is the difference between Turret and Capstan lathe ? [10]

(*b*) Explain the need of transfer line from manufacturing point of view. [6]

Or

With the help of neat sketch, explain principle of operation, kinematic system, types of tools and jobs, applications for (any *two*) : [16]

(1) Shaping machine

(2) Planning machine

(3) Slotting machine.

3. With respect to construction of broaching, explain the following :

(1) Configuration of broaching tools (with neat sketch) [6]

(2) Material for broach [4]

(3) Geometry of broaching teeth and their cutting edges. [8]

Or

(*a*) Draw a neat sketch of dies for manufacturing external screw threads : [6]

(1) Split die

(2) Spring die

(3) Pipe die

(*b*) Explain Gear manufacturing process by Gear Hobbing and Gear Grinding. [12]

Section II

4. (*a*) Elaborate 'FMS introduces flexibility in every facets of manufacturing'. [4]

(*b*) Write a manual part program for tuning a raw bar from a work piece of the following dimensions :

Work Piece : Bar ϕ 60 mm dia. with length of 50 mm. Raw bar machined single bar with two steps of dia. ϕ 50 & ϕ 25 with step lengths of 25 mm each. [12]

Or

For machining centre, explain the following : [16]

(1) Principles, working, advantages

(2) Applications and parts programming.

5. (*a*) A circular Bank of 30 mm diameter is to be cut from 2 mm thick 0.1 C steel sheet. Determine the die and punch sizes. Also estimate punch force and stripping force needed. Assume the following for steel : [8]

Tensile strength : 410 MPa, Shear strength : 310 MPa.

(*b*) Explain with suitable sketch, the drawing operation. Indicate the mathematical expression for Blank size and drawing force calculations. [8]

Or

(*a*) Explain the following sheet metal working process (any *three*) : [6]

(1) Piercing

(2) Notching

(3) Forming

(4) Coining

(5) Drawing.

(*b*) Explain with neat sketch any *five* with reference to press working : [10]

(1) Bed

(2) Bloster plate

(3) Die block

(4) Knock out

(5) Punch plate

(6) Pitman

(7) Shut height

(8) Guide posts

6. Explain the following elements of jigs and fixtures : [18]

(1) Locating elements

(2) Supporting surfaces and Base

(3) Clamping elements

(4) Tool guiding frame and bushes for jig

(5) Indexing systems

(6) Auxiliary elements.

Or

(*a*) List at least *four* types of drill bushes for drilling jig. [4]

(*b*) Explain the procedure of error analysis for locating the workpiece in jigs and fixtures for dimensional and geometrical errors. [6]

(*c*) Explain the following elements of jigs (any *two*) : [8]

(1) Locating device

(2) Clamping device

(3) Tool guide.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4757]-250

S.E. (Production) (S/W) (II Sem.) EXAMINATION, 2015

PRODUCTION AND INDUSTRIAL MANAGEMENT—I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Use of calculator is allowed.

(*iv*) Figures to the right indicate full marks.

(*v*) Answer *one* question from Q. Nos. **1** & **2**, **3** & **4**, **5** & **6**, **7** & **8**, **9** & **10**, **11** & **12**.

SECTION I

1. (*a*) Explain concept of Scientific Management. [8]

(*b*) Explain contribution of F.W. Taylor in the Field of Management. [8]

P.T.O.

Or

2. (*a*) Explain types of Management along with example. [8]

(*b*) Explain the role of Public Private firms in Indian society. [4]

(*c*) Write a short note on Group Dynamics. [4]

3. (*a*) What are the different basics technique used in Industrial Engineering ? [8]

(*b*) Define Productivity. Explain the factors affecting productivity. [8]

Or

4. (*a*) What do you mean by Plant Layout ? Explain in detail software used in it. [8]

(*b*) Write a short note on Condition Base Monitoring. [4]

(*c*) Explain steps Involved in Production Planning (Flow Chart). [4]

5. (*a*) What are work elements ? Explain various types of work elements in detail. [8]

(*b*) Explain micro-motion study. How is it carried out ? What are different symbols used in Micro-Motion Study ? [10]

Or

6. (*a*) Importance of Biodynamic Cycle in Ergonomics. [6]

(*b*) Explain SIMO Chart in detail. [6]

(*c*) Explain role of computer in method study. [6]

SECTION II

7. (*a*) Explain aim and objective of time study. [6]

(*b*) A stopwatch study of a clerical operation gave the following elemental data :

Element	Cycle Time				
	1	**2**	**3**	**4**	**5**
A	0.27	0.21	0.13	0.14	0.14
B	0.56	0.57	0.54	0.68	0.75
C	0.21	0.18	0.11	0.18	0.17
D	0.23	0.30	0.31	0.35	0.35

(*i*) Element B is machine paced

(*ii*) The operator is rated at 110%.

Allowance for this job is 11%. Calculate standard time of the job. [12]

Or

8. (*a*) Explain the following : [8]

(*i*) Machining Allowance

(*ii*) Qualified Worker

(*iii*) Interface Allowance

(*iv*) Contingency Allowance.

(*b*) List out the different theories of Motivation. Explain any *two* theories in detail. [10]

9. (*a*) What is meant by leadership ? Explain the Contingency Theory of Leadership. [8]

(*b*) Explain the Trait Theory of Leadership. [4]

(*c*) Explain the role of Government in development of Industry. [4]

Or

10. (*a*) Write short notes on the following : [12]

(*i*) Job Evaluation and Merit Rating

(*ii*) Types of different Incentive schemes.

(*b*) Explain various functions of HR Department. [4]

11. (*a*) Explain the Break-even Analysis in detail along with example. [8]

(*b*) Explain various sources of Finance and role of Financial Institute in Indian Industry. [8]

Or

12. (*a*) Explain along with example different types of Overhead Costs and also explain different methods for cost accounting. [8]

(*b*) Write a short note on Engg. Economics. [8]