SCHOOL OF Chalimbana University **BUSINESS**

BMT1100 BUSINESS MATHEMATICS AND STATISTICS

SESSIONAL EXAMINATION JULY - 2022

TIME ALLOWED: 3HOURS

INSTRUCTIONS TO THE CANDIDATES

1. There are a total of **SEVEN(7)** questions in this paper
2. You are required to **answer any five (5) questions and each question carry equal marks.**
3. Statistical and future /present value tables will be provided.

QUESTION ONE

a) Given that $A^T = \begin{bmatrix} 2 & 11 \\ 0 & 2 \\ -3 & 5 \end{bmatrix}$, Find A **[1marks]**

b) Find the value of $\lim_{x \to 0} \frac{6x^4 + 5}{x^4 + x^3 + x^2 + 1}$ [**2marks]**

c) Solve the equation (a) $3^{2x+1} = 81$ **[2marks]**

d) A firm manufacturer knows that if x (hundred) product are demanded in a particular week: the total cost function in(k000) is $TC = 14 + 3x$ and the total revenue function in (k000) is $TR = 19x - 2x^2$

i) Derive the total profit function **[2marks]**

ii) find the profit break-even point **[3marks]**

iii) Calculate the level of demand that maximize profit and the amount obtained **[4marks**]

d) Solve the following simultaneous equation using any method

$$x + 2y + 2z = 7$$

$$4x + 5y + z = 11$$

$$7x - 4y - z = 1$$ **[6marks]**

QUESTION TWO

a) If the net investment function is given by $I(t) = 800t^{\frac{1}{3}}$

Calculate

i) the capital formation from the end of first year to the end of the eight year **[2marks]**

ii) the number of years required before the capital stock exceeds k48,600. **[3marks]**

b) The demand and supply functions for a product (bags of Maize) are given by

Demand function: $Q = -5P + 290$

Supply function: $Q = 10P - 40$

i) Calculate the equilibrium price and quantity **[4marks]**

ii) Plot the demand and supply functions in the form $P = g(Q)$. Illustrate graphically the consumer and producer surplus at equilibrium. **[4marks]**

iii) Calculate the consumer surplus at equilibrium **[3marks]**

iv) Calculate the producer surplus at equilibrium **[3marks]**

v) Calculate the total surplus at equilibrium **[1mark]**

QUESTION THREE

(a) Classify the following variables as discrete or continuous

(i) The weight of a person **[1mark]**

(ii) Total scores for the game between Zambia vs Algeria **[1mark**]

(iii) Prime numbers less than ten [**1mark]**

(iv) The earning per month for the government worker [**1mark]**

(v) The capacity of water in a dam **[1mark]**

(b) The annual profits made by a random sample of 37 companies in the textiles industry are shown in the table below:

Profit (k000)	Number of companies
$10 \leq x \leq 20$	3
$20 \leq x \leq 30$	7
$30 \leq x \leq 40$	12
$40 \leq x \leq 50$	10
50 $x \leq 60$	5

i) Construct a histogram to represent the above data **[4marks]**

ii) Calculate the

a) Mean [**4marks**]

b) Standard deviation **[5marks]**

c) Coefficient variation **[2 marks]**

QUESTION FOUR

a) A principal of k25000 is invested at 12% interest compounded annually. After how many years will the investment first exceed k250000? **[3marks]**

b) Mr Chiluba borrows k75000 from a bank at an interest rate of 18% per annum and agrees to make equal semi-annual payments for 2 and half years

i) Calculate the equal semi-annual payment **[3marks]**

(ii) Prepare a loan amortisation schedule for Mr Chiluba **[8marks]**

c)Suppose that you can invest k25000 in a business venture that guarantees you cash flow k12000 at end of year 2, k9000, at end of year 3 and k7000 at end of year 5. Assuming 7% discount factor compounded annually, calculate the net present value of this business and interpret it **[7marks]**

QUESTION FIVE

a) Let Z ~ N(0,1)

find i) $P(Z \leq 1.78)$ **[2marks]**

ii) $P(-1.34 \leq Z \leq 1.34)$ **[2marks]**

b) If 80% of the bolts produced by a machine are good, determine the probability that out of 4 bolts chosen at random.

i) One bolt will be defective **[1 mark]**

ii) At most two bolts will be defective [**3marks]**

c) Find the 95% confidence interval for the population mean from the given data of sample size 5. The data set are 2,6,5,8 and 7. [**5marks**]

d) A brokerage firm wants to determine whether the service it provides to rich customers differs from the service it provides to lower customers. A sample of 500 customers is selected and each customer is asked to rate his/her broker. The results are shown in the table below.

		Under 2000	2000-5000	Over 5000	Total
Broker rating	Outstanding	48	64	41	153
	Average	98	120	50	268
	Poor	30	33	16	79
Total		176	217	107	500

Test to see whether there is evidence that rating and customer income are dependent use level of significance $\alpha = 0.10$ **[7 marks]**

QUESTION SIX

a) Differentiate $x^4y + 2xy - 5y^2 = 5$ [**4marks]**

b) The following data relate to set of commodities used in a particular process

Commodity	P1	Q1	P2	Q2
A	30	90	38	100
B	70	20	80	15
C	50	16	40	30
D	15	900	10	1100

i)Calculate a) Laspeyres price index [**8marks**]

b) Paasche price index **[6marks]**

ii) interpret each of the above indices **[2marks]**

QUESTION SEVEN

Given five pairs of observations

v	20	30	40	50	60	70	80	90
t	45	52	64	66	91	86	98	104

a) Compute the least square regression line **[6marks]**

b) Compute the correlation coefficient and coefficient of determination **[5marks]**

c) Predict the value of t when v=60 **[2marks]**

d) Obtain a 95% confidence interval for the slop of this regression line **[7marks]**

END OF EXAM PAPER ALL THE BEST