The University of Zambia
School of engineering
Department of Geomatic Engineering

University Examinations – Semester I

GE 481: Introduction to Surveying **5th November 2010**

Instructions

Time: Three (3) hours.
Answer four (4) questions in total

Three (3) from section A for all students. Use tables provided at the back

One (1) question from section B for Engineering and Agricultural Science Students only

PLEASE! Answer different sections on separate answer Booklet(s). DO NOT tie them together.

Section A: Answer any three (3) questions from this section

Question 1 (5 + 4 +5 + 8 + 3)

Driving pegs at 30 m intervals with the tops of the pegs on the required gradient, a gradient of 1 in 120 was set out falling from elevation 1195.700 m. After a period of time it was suspected that some of the pegs had been disturbed and the following observations were taken in checking their levels.

LEVELLING

PNT	READINGS			HEIGHT OF INSTRUMENT	REDUCED LEVEL	REMARKS
	BS	IS	FS			
	1.760					BM1
	2.645		0.725			
	1.965		1.420			
		0.935				Peg 1
		1.180				Peg 2
		1.455				Peg 3
		1.685				Peg 4
		1.930				Peg 5
		2.175				Peg 6
	0.690		2.440			Peg 7
		0.925				Peg 8
		1.175				Peg 9
		1.435				Peg 10
	0.615		1.215			
			1.875			BM1

a) Calculate the amount of error at each peg

b) With the aid of clearly labelled diagrams describe any two of the three main types of levelling instruments

c) List any three other methods of levelling

Question 2 (3 + 16 + 6)

A steel tape of nominal length 50m was used to transfer a level from a reference line near the base of a vertical reinforced concrete column to a reference line near its top.

A 50N weight was attached to its free end and the tape was hung freely down the side of the column such that its 1.000m mark was against the bottom reference line. A reading of 28.439m was obtained at the top reference line.

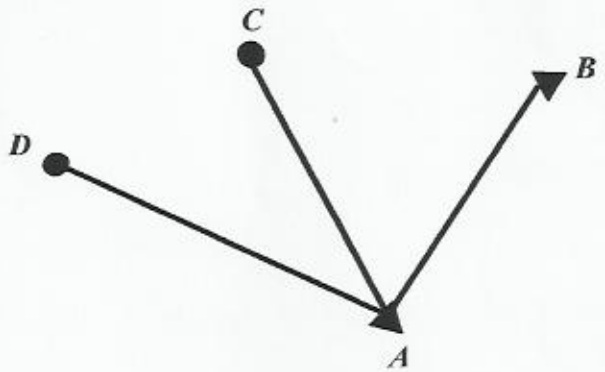
The tape used was standardised on the flat as 50.037m at a tension of 70N and a temperature of 20°C. It had a cross sectional area of 1.9 mm^2, the coefficient of thermal expansion of the tape material was 0.0000112 per °C and Young's modulus was 200 kN/mm^2~~mm~~. During the measurement the mean temperature of the tape was 12°C.

Calculate the **vertical distance** between the two reference lines.

Question 3 (7 + 12 + 6)

In order to determine the plane coordinates of points ***C*** and ***D***, a minute Theodolite was correctly mounted above point A. The distances ***AC*** and ***AD*** were measured twice along the slope with a tape as 160.936m and 272.155m. The known coordinates of ***A*** and ***B*** are:

A	64853.708mE	83276.404mN
B	64941.538mE	83280.606mN



The horizontal angles from point ***A*** are observed in two rounds and for the vertical angle only one FL and FR reading are taken.

The University of Zambia
School of Engineering
Department of Geomatic Engineering

2007 Academic Year First Semester Examinations
GE 481: Introduction to Geomatics

Examination date: 06th September 2007

Instructions

Time: Three (3) hours.

Answer four (4) questions in total

Three (3) from section A for all students. Use tables provided at the back

One (1) question from section B for Engineering, Agricultural Science, Natural Science and Mining Engineering Students

One (1) question from section C for Geology Students.

PLEASE! Answer different sections on separate answer Booklet(s). DO NOT tie them together.

Section A: Answer any three (3) questions from this section

Question 1 (5 + 5 + 7 + 8)

a) A survey line was measured with a tape, believed to be 20m long, and a length of 284.623m resulted. On checking, the tape was found to measure 19.951m long.

i.) What was the correct length of the line?

ii.) If the line lay on a slope of 1 in 20, what would be the reduced horizontal length used in the plotting of the survey?

iii.) What reading is required to produce a horizontal distance of 15.085m between two site pegs, one being 0.662m above the other?

b) Distances are very important in Land Surveying as they determine the scale of a network. Several methods are used for distance determination. The method of choice for distance determination depends on a number of factors. List these factors.

Question 2 (10+9+6)

a) Define Geomatics and discuss any four of the disciplines it is divided into.

b) With the aid of diagrams, describe any two of the conventional types of levelling instruments.

c) Show and explain the three main axes of the theodolite.

Question 3 (8 + 8 + 5 + 11)

A levelling survey was undertaken in aid of the construction of a proposed sewer. The consecutive staff readings obtained during the survey are given in table 1 below.

Table 1

Staff Reading (m)	Distance (m)	Remarks
1.403	-	BM 1144.201m above MSL
1.904	0	Ground Level at Outfall
1.190	40	Ground Level
0.845	80	Ground Level
1.157	120	Ground Level at CP
2.963	120	Ground Level at CP
1.491	160	Ground Level
1.267	200	Ground Level
1.689	-	TBM 1145 .721m above MSL

Details of the proposed sewer are given in table 2 below.

Table 2

Chainage (m)	Manhole	Invert level (m)	Remarks
0	Outfall	1141.981	Gradient of Outfall to MH at A is to be 1 in 140
100	A	?	
150	B	1143.503	
200	C	1145.402	Outside Ø of sewer is 0.4m

Ø stands for diameter

a) Book and reduce the levels in the booking form provided, carrying out the necessary checks.

b) Draw a longitudinal section of the ground.

c) Calculate the invert level of MH "A" and show the sewer line on the section.

d) A boning rod (traveller) 2.50m long was used when the trench was excavated. Calculate the staff readings adopted when setting out the sight rails at the outfall from instrument position 1 and at the manholes A, B and C from instrumenmt position 2. Assume the level was set up exactly as it was in (a).

$x = \frac{100}{140}$ 140 — 1m
100 — x

140m — 1m
100m — x

Question 4 (9+11+5)

a) In order to determine the coordinates of point *P* angular observations from two known points *UZ1* and *UZ2* were made in two arcs. Complete the field form 1 (attached at the back of this exam paper) of the observations.

Horizontal angles observations at *UZ1* (gons)

Pnt	Readings		Simple Mean	Reduced Mean	Remarks
	FL	FR			
UZ2	000.0580	200.0576	000.0578	00.0000	R.O
P	096.9131	296.9132	096.9132	096.8554	
UZ2	100.2276	300.2260	100.2268	000.0000	R.O
P	197.0820	397.0817	197.0819	096.8551	

Horizontal angles observations at *UZ2* (gons)

Pnt	Readings		Simple Mean	Reduced Mean	Remarks
	FL	FR			
UZ1	100.5028	300.5021	100.5025	000.0000	R-O
P	060.1928	260.1934	060.1931	-040.3094	
UZ1	150.6008	350.6010	150.6009	000.0000	R-O
P	110.2913	310.2910	110.2912	-040.3098	

Vertical angles observation at *UZ1* (gons)

Pnt	Readings		Reduced FL	Reduced FR	Mean
	FL	FR			
P	101.0354	298.9647	-001.0354	-001.0353	-001.0354

The slope distance *UZ1-P* was measured with EDM as 158.901m. Calculate the mean coordinates of point *P* given that the coordinates of the known points are:

UZ1 (3101.863mE, 40.530mN) *UZ2* (2936.432mE, 191.453mN)

b) Describe the L0 coordinate system as used in Zambia

End of Section A

Section B: Engineering, Agricultural Science & Mining Engineering students only. Answer question 5 from this Section

Question 5 (6 + 4 + 2 + 4 + 5)

a) What four functions must all GIS include?

b) What is the fundamental difference between raster and vector GIS?

c) Layers in a GIS can be used to:

i) Group related geographic features by function
ii) Isolate point, line, and area features
iii) Develop thematic maps
iv) Combine non-spatial and attribute information
v) Highlight logical relationships among geographic features
vi) To make a map colourful

NB: Only four of the above answers are correct. You will be penalized for answering all.

d) What does the scale on the map entail?

e) State two advantages of the following data formats in GIS:

vii) Raster
viii) vector

d) State and explain *briefly* any two data capture methods in GIS.

End of Section B

Section C: Geology Students only.

INTRUCTIONS: ANSWER TWO QUESTIONS USING SKETCHES WHEREVER POSSIBLE

Question 6 (2 + 3 + 7.5)

i.) Name two remote sensing and two ground techniques used for geological mapping.

ii.) What is remote sensing? Give two very simple visual systems that may be used as examples of remote sensing systems.

iii.) Explain briefly how remote sensing information is acquired through for example a satellite?

Question 7 (2 + 8.5 + 2)

i.) What is plane table?

ii.) Describe briefly how you would use plane table to geologically map a given area

iii.) At what scale is plane table employed?

Question 8 (12.5)

Suppose you were requested to map an area with very good rock outcrop within the Chilileka area. Outline steps to be followed also stating which equipment would be useful.

END OF EXAMINATION

Good Luck