FACULTY OF ENGINEERING AND THE ENVIRONMENT

DEPARTMENT OF MINING ENGINEERING

MINING SURVEY

EMI 3101

Final Examination Paper

January 2021

Time Allowed: **3 hours**

Total Marks: **100**

Examiner's Name: **Miss N.R Gwati**

Authorised material: **Calculator**

INSTRUCTIONS

1. This paper contains **ONE** section with **FIVE** questions
2. Answer **QUESTION 1** and **any other THREE questions**
3. Each question **carries 25 marks**
4. Where a question contains subdivision, the mark value of each subdivision is shown in brackets
5. Start each question on a new page

Question 1

a. Imagine you are Director of a large mining concern. You wish to recruit a mine surveyor. What will be the duties of the surveyor at your mine? **[5 marks**]

b) What is the difference between open and closed traverse? Which of the two is more accurate and why? **[5 Marks]**

c) What precautionary measures should one take to ensure that accurate results are achieved when carrying out a traverse? **[3 marks]**

d) In order to mark the boundary of a mining engineering project, a link traverse was run from control point T2 to control point T3 in order to coordinate points A, B and C. Use the Bowditch method to calculate the final coordinates of A, B and C. **[15 marks]**

Observations

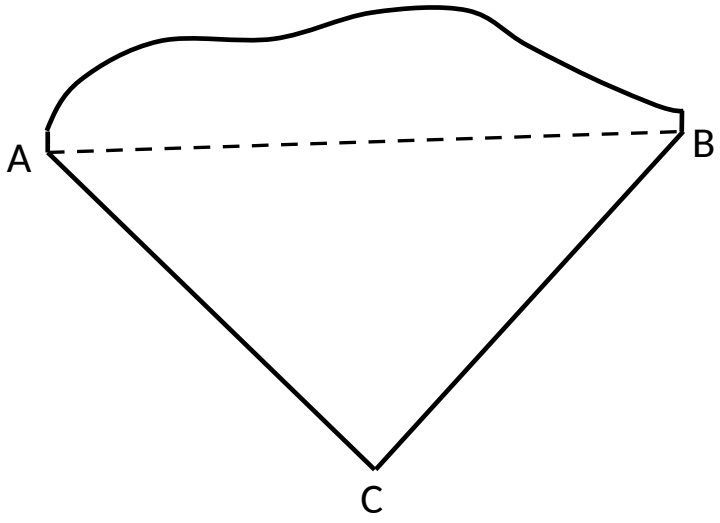
@	Clockwise angle	Leg	Horizontal distance (m)
T2	131.25.20	T2 – A	147.65
A	138.37.00	A –B	139.00
B	147.43.20	B –C	111.57
C	261.21.40	C – T3	121.33
T3	259.33.00		

	Coordinates	
	Y (m)	X(m)
T2	-405.15	-351.00
T3	-847.86	-355.00

Line	Direction
T2-T1	165.00.00
T3-T4	23.40.20

Question 2

a) The site of a new mine is bound by two straight lines i.e. AC and BC and an irregular line between points A and B as shown bellow



The following data is given:

Line	AB	BC	AC
Length (m)	135	250	370

The following offsets were taken at 15m interval from the survey line AB to the irregular boundary line

Distance (m)	0	15	30	45	60	75	90	105	120	135
Offset (m)	3.50	4.30	6.75	5.25	7.50	8.80	7.90	6.40	4.40	3.25

Calculate the total area of the site by:

i. The trapezoidal rule
ii. Simpson's rule

[15 marks]

b) Explain how volume may aid a Mine Surveyor in coming up with a project budget. **[5 marks]**

c) Briefly describe how the volume of a surface ore stockpile can be determined

i) With the aid of a survey/GIS software **[5 marks]**

ii) Without the use of software **[5 marks]**

Question 3

a) With the aid of a diagram discuss the term datum as used in levelling. **[2 marks]**

b) Outline the advantages of using electronic survey instruments when carrying out surveys within mine workings. **[3 marks]**

c) A theodolite with multiplying constant 100 and additive constant 0 was used to observe the following in Table 2: (staff held vertical at A and C)

Table 2

Station	**Staff position**	**Stadia Readings**			**Vertical angle(Z)**	**Horizontal angle**
		Lower	**middle**	**Upper**		
B (hi=1.58m)	A	2.853	3.047	3.240	86º39’20’’	73º40’16’’
	C	1.834	2.334	2.834	94º16’34’’	103º15’10’’

Given that the instrument height was 1.58m at B and that the reduced level of B is 1450.65.

Calculate

i. Reduced level of A and C **[6 marks]**

ii. The horizontal distance AC **[2 marks]**

C) A page of a levelling field book has been damaged by white ants and the readings marked X are missing. Determine the missing values and complete the reduction of the field book. Show all checks

BS	IS	FS	HPC	RL	Remarks
X			X	209.510	BM1
	1.675			X	
	X			210.425	
	3.355			209.080	
0.840		X	209.520	X	CP
	X			208.275	
	X			210.635	underside
X		2.630	X	X	X
	X			206.040	
	1.920			205.895	
		X		205.690	

[**12 marks**]

Question 4

a) A Mine orientation survey has been undertaken with two plumb lines (i.e. P_1 and P_2) in one vertical shaft and using the Weisbach method as shown in the figure 1.

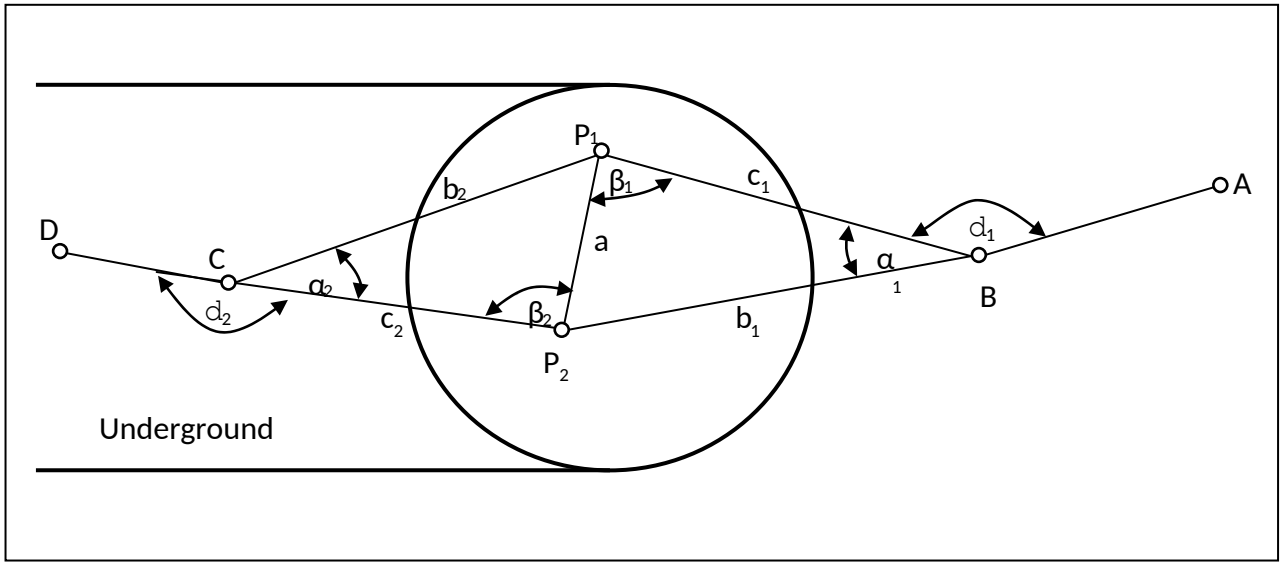


Figure 1

Given that the coordinates of point B are: Y_B = +360.320, X_B = +538.435 and bearing of line AB= 310°15'20'',the following values of the measured angles and distance have been obtained.

On the surface: a=4.001m, b_1=8.030m, c_1=4.035m, d_1=160°20'20'', α_1=0°08'10''

Underground: a=3.997m, b_2=7.005m, c_2=3.015m, d_2=178°25'40'', α_2=0°16'00''

Calculate the coordinates of point C and the bearing of the line CD **[12 marks]**

b) Briefly describe the optical method of transferring control from the surface to underground workings. Use diagrams and equations to illustrate your answer. **[9 marks]**

c) Why should the underground control networks be connected and orientated into the same coordinate system as the surface networks? **[4 marks]**

Question 5

a) Briefly describe the three types of plans that must be prepared and maintained at each mine in Zimbabwe. For each type of plan explain the relevance of preparing and updating it. **[6 marks]**

b) A mining company is planning to introduce GIS into its operations, outline three (3) areas in mining operations where GIS can be used, for each area of application, outline how the introduction of GIS would improve processes or benefit the mining operation. [**9 marks]**

c) Discuss the current status of GIS applications in mining in Zimbabwe, highlighting the contributing factors to the status. **[4marks]**

d) GPS has several applications in various disciplines. Explain the roles that GPS can play in the prospecting and mining of mineral resources. Highlight the merits and demerits of using GPS in a mining environment**.** **[6 marks]**