



**FACULTY OF ENGINEERING AND ENVIRONMENT**  
**DEPARTMENT OF MINING ENGINEERING**  
**SURVEYING FOR ENGINEERS**

**EMI 2204**

**Final Examination Paper**

**June 2020**

This examination paper consists of 4 pages

**Time Allowed: 3 hours**

**Total Marks: 100**

**Examiner's Name: Mr A.A Mukichi**

**INSTRUCTIONS**

1. This question paper consists of one section with 6 questions, **YOU MUST ANSWER QUESTION ONE (1) and ANY OTHER THREE (3) QUESTIONS.**
2. Each question carries 25 marks.
3. Answer each question on a new page and write as eligible as possible.

**Additional Requirements:**

Non-Programmable Calculator

**MARK ALLOCATION**

<b>Question 1 to 6</b>	<b>25Marks</b>
<b>Part Questions</b>	<b>As shown in each part question</b>
<b>Total Attainable</b>	<b>100</b>

**NB: DO NOT TURN OVER THE QUESTION PAPER OR COMMENCE WRITING UNTIL INSTRUCTED TO DO SO**

**Question 1 [25marks]**

- a) State the trapezoidal rule for determining areas. What assumption is made in calculating area using this method? Describe any other two methods that can be used for the determination of areas enclosed by irregular lines.

**[6marks]**

- b) The levels in the Table 1 were recorded from a centre line of a road that was being surfaced.

Complete the reduction for these readings using the Rise and Fall method, applying all arithmetic checks. **[10marks]**

Table 1: Levelling Readings

BS	IS	FS	REMARKS
0.738			BM RL = 115.509
	1.094		Point A
	1.713		B
	2.265		C
0.942		2.685	Change point CP
	1.100		D
	1.533		E
	-3.133		Underside of a Bridge
0.741		1.887	Change point
	1.634		F
	2.472		G
		2.265	BM RL = 111.093m

- c) For the Table 1, state the other method for reducing the levels, and discuss the merits of each method. **[4marks]**
- d) Outline changes that a Total Station has brought to the survey procedures. **[5marks]**

**Question 2 [25marks]**

- a) Traversing is one of several methods that can be used for establishing control. State any other four alternative methods and using sketches or otherwise, explain the types of measurements that are taken in the four mentioned methods. **[8marks]**
- b) Global Positioning Systems (GPS) are having a great influence in Engineering Surveying. Discuss, in brief, the advantages and disadvantages of the GPS approach, compared with conventional survey methods. **[5marks]**
- c) State, giving a brief explanation of errors found in EDM measurements. **[5marks]**
- d) Briefly describe the two main classes of Surveying. **[4marks]**
- e) What functions do the following parts in an optical theodolite perform?
- rifle sight
  - optical plummet
  - selector knob
- [3marks]**

**Question 3 [25marks]**

- a) Adjust the incomplete traverse in the Table 2 by means of the BOWDITCH adjustment method and determine the final co-ordinates of B, C, D and E.

**[12marks]**

Table 2: Traverse Readings

Line	Distance (m)	Co-ordinate Difference		Final Co-ordinates		
		$\Delta x$	$\Delta y$	X	Y	
				A	253.32	6354.24
AB	527.81	161.62	502.45	B		
BC	438.95	209.45	385.72	C		
CD	247.35	213.89	-124.30	D		
DE	425.63	-45.79	-423.16	E		
EF	600.87	287.74	528.00	F	1080.32	7222.89

- b) A client asks your firm to carry out a detail topographic survey for an area on which farm infrastructure is to be constructed. The survey need not be on the national grid. Explain in detail the steps you would take to produce the detail survey plan. With adequate resources available, what set of instruments would you prefer for the data acquisition, processing and final output. Justify your choice. **[10marks]**
- c) Name the three main important lines or axes in a theodolite. **[3marks]**

**Question 4 [25marks]**

- a) With the aid of clearly labelled diagrams, distinguish the two terms:
- Precision
  - Accuracy **[8marks]**
- b) Imagine that on your way to campus from hostels there is a large pit. The Department of Geomatics and Survey wishes to fill this pit with rubble that has to be transported from a source off campus. You have been tasked to give an estimate of the volume needed to fill the pit. Describe in detail a method you may use to accomplish this task paying attention to equipment and any software that you may use. **[10marks]**
- c) Differentiate between open and closed traverse. Which one is more recommended and why? **[7marks]**

**Question 5 [25marks]**

- a) In the context of levelling, distinguish between the following terms and concepts:
- level line and line of sight
  - datum and reduced level
  - foresight and intermediate sight **[6marks]**
- b) Come up with reasonable classification of GIS analysis functions. **[5marks]**
- c) Imagine you are a Manager of a large construction company. You wish to recruit a surveyor. What will be the duties or capabilities of the best candidate you wish to recruit for the post? **[5marks]**
- d) The following coordinates form a five-sided figure. Using the given coordinates, calculate the area enclosed by this figure. **[9 Marks]**

Table 3: Coordinates Enclosing an Area

Point	N (m)	E (m)
1	505.00	501.00
2	499.98	855.97
3	280.21	976.89
4	95.65	586.48
5	425.53	265.40

**Question 6 [25marks]**

- a) In levelling it is good procedure to set up midway between two points whose height difference is to be determined, whilst keeping the sight distances relatively short. Briefly explain which errors/effects can be eliminated by such procedure. **[5marks]**
- b) Discuss the current status of GIS in Zimbabwe, highlighting the contributing factors to that status. What is the future of GIS in Zimbabwe?  
**[10marks]**
- c) Explain the relevance of Engineering Surveying to a Civil/Mining Engineer making reference to the 3 stages of an engineering project namely design, construction and post construction stage.  
**[6marks]**
- d) Briefly describe any two types of databases that can be used to store data in a G.I.S.  
**[4marks]**

End of  
Examination