GWANDA STATE UNIVERSITY.

FACULTY OF ENGINEERING AND THE ENVIRONMENT.

DEPARTMENT OF GEOMATICS AND SURVEYING.

Surveying 1.

ESG 1108.

Final Examination Paper

JUNE 2026

Examiner's Name: **Miss M.M.Shoko.**

This examination paper consists of 4 pages

INSTRUCTIONS

1. *Answer ALL Questions.*
2. *Time allowed 3 hrs.*
3. *Scientific Calculators may be used.*
4. *Programmable calculators are not allowed.*

TOTAL MARKS 100

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		QUESTION 1: DEFINITIONS	**25**
a)		Define the following terms:	
	i)	Surveying	2
	ii)	Surveyor	2
	iii)	Geomatics	2
	iv)	Join	2
	v)	Polar	2
b)	i)	Briefly discuss the history of surveying.	5
	ii)	What are the applications of Surveying?	4
c)		What are the main classes of surveying, and how are they distinguished from each other?	6
		QUESTION 2: SURVEY MEASUREMENTS	**25**
a)		An argument has arisen at your workplace, involving some workmates who do not fully understand the surveying profession. Some insist that errors are not important in measurements, while others say they are important. Write all 3 types of errors found in surveying, briefly explain the errors, and state the importance of managing them.	9
b)		Distinguish between precision and accuracy in the context of surveying.	4
c)		A distance of 220.650m was measured with a steel band of normal length 30m. On standardizing the band it was found to be 30.003m.Calculate the corrected measured distance assuming the error is evenly distributed throughout the tape.	3
d)		A 30m band standardized at 20 °C was found to be 30.003m. At what temperature is the tape exactly 30m? Given that the coefficient of expansion of steel = 0.000011/0C	3
e)		A 50 m steel tape has a cross-sectional area of 5 mm^2 and is standardized under a tension of 50 N. Given that the modulus of elasticity of steel is E = 210 kN/mm^2, calculate the Tension correction of the tape when subjected to this standard tension.	3
f)		Calculate the sag correction necessary in the case of a 50m heavy tape of 1.5kg with a standard tension of 80N.	3

QUESTION 3:PLANE TABLE SURVEYING — 10

a) Plane table surveying forms the basis of modern methods in surveying. Describe 4 methods of plane table surveying. — 4

b) State two advantages and two disadvantages of using a plane table surveying. — 4

c) What is the difference between direct and indirect contouring? — 2

QUESTION 4: LEVELLING — 24

Table 1 below is an abstract of a leveling field sheet. Complete the table using the Rise and Fall Method, applying all necessary checks. — 15

- Determine the elevations of points A to L, given that the elevation of Bench Mark BM008 is 1678.982 m above mean sea level.
- The levelling closed on Bench Mark BM017 with a height of 1682.278 m.
- Calculate the misclosure and assess whether it is acceptable, given that the levelling route was 9 km and constant C = 8.
- Present the reduced levels clearly.

Table 1 :

BS	IS	FS	Remark
3.786			BM008
	3.256		A
	1.345		B
1.927		3.984	C CP
	1.045		D
	4.937		E
4.120		0.251	F CP
	0.725		G
	2.624		H
2.945		3.735	I CP
	4.773		J
	0.359		K
		1.528	BM017

What is the collimation error, and its purpose?. — 4

Describe the method used to determine the collimation error. — 5

		QUESTION 5: COORDINATE SYSTEMS	**16**
	a)	Define the term Polar.	2
	b)	Define the term Join.	2
	c)	Given the following coordinates of point A and its distance and bearing to point B: Y = +8976.987 X = +6423.968 Distance AB = 3216.752 m Direction AB = 243° 45′ 31″ Calculate the coordinates of point B.	6
	d)	Given the following coordinates of points C and D: Y: X: C +42313.896 -196754.245 D +42786.674 -196004.456 Task: Calculate the join CD.	6