



GWANDA STATE UNIVERSITY
FACULTY OF ENGINEERING AND THE ENVIRONMENT
DEPARTMENT OF GEOMATICS AND SURVEYING

ENGINEERING SURVEY

EGS 2107

Examination Paper

Semester I 2024

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Examiner's Name: Mr. V Mlilo

INSTRUCTIONS

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

1	a	Give 5 recommendations you would give to the Surveyor General towards establishing and expanding the CORS network in Zimbabwe.	[10]
	b	Compare and contrast EDM (Electronic Distance Measurement) and GNSS by stating two similarities and any two differences.	[5]
	c	Explain how double-differencing positioning eliminates the effects of satellite and receiver clock and phase biases.	[10]

2	a	With the aid of a well-annotated sketch diagram, describe the relationship between a section of a proposed road and the respective mass-haul diagram. Define and indicate the balance point and overhaul.	[6]
	b	State and explain any two considerations in coming up with the optimal earthwork designs.	[4]
	c	The centre line of a proposed road of formation width 12.00 m is to fall at a slope of 1 in 100 from chainage 50m to chainage 150 m. The existing ground levels on the centre line at chainages 50 m, 100 m and 150 m are 71.62 m, 72.34 m and 69.31 m respectively and the ground slopes at 1 in 3 at right angles to the proposed centre line. If the centre line formation level at chainage 50 m is 71.22 m and side slopes are to be 1 in 1 in cut and 1 in 2 in fill, calculate the volumes of cut and fill between chainages 50 m and 150 m using the prismatic formula. <i>Hint: Calculate cut and fill areas for a general section and then apply those equations for each section.</i>	[15]

3	a	Compute the area of the cross-section if the formation width is 12 m, side slopes are 1 to 1, the average height along the centreline is 5 m, and the transverse slope of the ground is 10 to 1.	[7]
	b	As an engineering surveyor, when do you think it is advantageous to use an unequal-tangent vertical curve instead of an equal-tangent one?	[2]
	c	A falling grade g_1 of 1.50 % intersects a rising grade g_2 of 2.50% at a vertex whose station and elevation are 46 + 00 and 895.00 m, respectively. An equal-tangent parabolic curve 200 m long has been selected to join the two tangents. Compute and tabulate the curve for stakeout at quarter stations.	[16]

4	a	Explain four geodetic survey methods that can be applied in deformation monitoring and state two field procedures for each survey method you will have to carry out to ensure accuracy.	[7]
	b	The reduced level at the intersection of a rising gradient of 1.5 per cent and a falling gradient of 1.0 per cent on a proposed road is 1193.60 above mean sea level. Given that the K-value for this road is 50, the through chainage of the intersection point is 2 +671.34m and the vertical curve is to have equal tangent lengths, Calculate:	

	i	The through chainages of the tangent points of the vertical curve.	[3]
	ii	The reduced levels of the tangent points and the reduced levels at exact 30m multiples of through chainage along the curve.	[12]
	iii	The position and level of the highest point on the curve.	[3]

THE END