



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

ENGINEERING SURVEY

ESG 2107

Examination Paper

Semester II 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	Zimbabwe in recent years commissioned continuous operating reference stations (CORS), explain the concept of CORS giving its advantages and disadvantages over terrestrial reference stations.	[10]
	b	As an engineering surveyor on a construction site explain the steps and field procedures you will take so that you can use a total station and GNSS instruments for fixing horizontal and vertical control points and also setting out detail points	[15]

2	a	State what is a mass haul diagram and explain any two of its characteristics	[5]
	b	With 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 following terms on the sketch diagram.	
	i	Balance point	[2]
	ii	Average Haul	[3]
	iii	Overhaul	[3]
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.	[12]	

3	a	The reduced level at the intersection of a falling gradient of 1.5 per cent and a rising gradient of 1.0 per cent on a proposed road is 1193.60m 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 the reduced levels of the tangent points and the reduced levels at exact 30m multiples of through chainage along the curve.	[16]
	b	On a road liable to flooding, a falling gradient of 3.09% meets a rising gradient of 2.78% at a reduced level of 3.16m. A parabolic vertical curve having equal tangent lengths is to be used to connect the two gradients, which meet at a chainage of 2619.52m. A K value of 20 will be used to obtain the curve length. Calculate the through chainage and the reduced level of the point at which a drainage gully should be located in order that it will be most effective.	[9]

4	a		State and explain any 4 considerations in coming up with the optimal earthwork designs.	[8]
	b		Explain 3 factors that you will consider in survey system design when carrying out a building deformation survey.	[7]
	c		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.	[10]

THE END