Second Semester Examination
2021/2022 Academic Session

July/August 2022

EAK163 – Geomatics Engineering

Duration : 3 hours

Please ensure that this examination paper consists of **EIGHT (8)** pages of printed material before you begin the examination.

Instruction This paper contains **FOUR (4)** questions. Answser **ALL** questions.

All questions **MUST BE** answered on a new page.

1.   (a)   Engineering survey is concerned essentially with fixing the position of a point in two or three dimensions. Plane Geomatic Survey is an example of two-dimension approach.

           i)   Describe **TWO (2)** characteristics of Plane Geomatic Survey.

           ii)   With the aid of sketches, describe **LINEAR** and **ANGULAR** measurements of Plane Geomatic Survey.

[9 marks]

    (b)   A survey line was measured with a tape, believed to be 20.00 m long, and a length of 284.62 m was determined. Upon checking, the tape was discovered to have found to measure 19.95 m long.

           i)   Determine the correct length of the line and justify your answer.

[3 marks]

           ii)   If the line lay on a slope of 1 in 20, calculate the reduced horizontal length used in the plotting of the survey.

[5 marks]

           iii)   Determine the reading required to produce a horizontal distance of 15.08 m between two survey pegs, one being 0.66 m above the other. Provide a sketch to illustrate the condition.

[8 marks]

2.   An open levelling survey was carried out along a roadway from A to B. The staff was held at a starting point, A, and then moved at 20 m intervals where these readings (in m) were taken: 0.765, 1.064, **(0.616),** 1.835, and 1.524. The level was then moved to another location and these readings were taken: 2.356, 1.378, **(2.063)**, 0.677, 2.027, where the last reading is Point B. The reduced level at Point A was 41.819 m.

Note: readings in bracket **()** are inverted staff readings.

a)   Complete the booking including the arithmetic check and determine the reduced level for B using the Rise and Fall Method. Use Form 1 given in the Appendix.

[20 marks]

b)   Determine the height of the instrument at the change point.

[3 marks]

c)   Determine the gradient from A to B.

[2 marks]

3.   A traverse is a series of connected lines whose lengths and directions are to be measured and the process of surveying to find such measurements is known as traversing. Traverse is a method in the field of surveying to establish control networks.

(a)   With the aid of sketches, describe the differences between two types of closed traverse. Suggest **ONE** (1) application of each closed traverse survey.

[10 marks]

(b)   In a closed traverse survey on stations ABCDE, the data was recorded as in Table 1. However, the line DE could not be measured due to some obstacles. Compute the missing length of line DE. Fill in your answer in Form 2 provided in the Appendix.

[15 marks]

TABLE 1

Point	Line	Bearing	Length (m)
A			
	AB	$188^0 28'30"$	119.997
B			
	BC	$281^0 40'50"$	63.400
C			
	CD	$6^0 20'30"$	72.555
D			
	DE	$30^0 18'20"$	?
E			
	EA	$126^0 32'30"$	45.160

4. (a) The area of a plot of land numbered ABCDE has the following coordinates as described in **Table 2**:

TABLE 2

Station	Easting (m)	Northing (m)
A	105.05 10x.05	202.05
B	207.7x	287.73
C	266.5x	184.43
D	287.45	152.03
E	190.89	88.84

X = final digit of index number

In general, the area by coordinates is given by the formula:

$$A = \tfrac{1}{2} [\Sigma\, N_i\, (E_{i+1} - E_{i-1})]$$

Determine the area of the plot of land by filling up the following table with the correct values.

Station	N_i	E_{i+1}	E_{i-1}	$N_i\,(E_{i+1} - E_{i-1})$
A				
B				
C				
D				
E				
			Total	

[12 marks]

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(b)   The embankment of a proposed road is shown in **Figure 1**. The dimensions of the embankment are as follows:

Road width = 20 m   Existing ground slope = 1 in 10
Side slopes = 1 in 2   Center height = 10 m

Calculate the side width and the total cross-sectional area of the embankment.
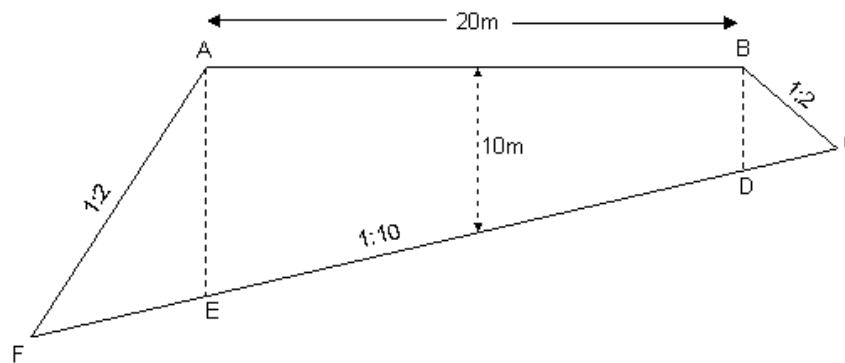
Figure 1

[9 marks]

(c)   The exact interpretation of any mass-haul diagram depends upon the correct positioning of the balance line. State **FOUR (4)** applications of a mass-haul diagram in a construction project.

[4 marks]

INDEX NUMBER:_____

BOOKING FORM 1: LEVELLING							
RISE AND FALL METHOD OF REDUCTION							
EAK 163/4: Examination 2022							
Back Sight	Intermediate Sight	Fore Sight	Rise	Fall	Reduced Level (RL)	Distance	Remarks

APPENDIX

Traverse Computation Form 2										
EAK163 – Final Examination 2021/2022										
Station	Bearing	Distance	Latitude		Departure		Corrected		Coordinates	
			N	S	E	W	Latitude	Departure	N/S	E/W

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