TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING AND

BACHELOR OF CIVIL ENGINEERING

TCV 4318 & ECV 4314 & ECV 4418 : ENGINEERING SURVEYING III

END OF SEMESTER EXAMINATION

SERIES: JANUARY 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination
-Answer Booklet, examination pass and student ID
This paper consists of five questions.
Attempt question ONE (Compulsory) and any other TWO questions.
Do not write on the question paper.

QUESTION ONE (COMPULSORY – 20 Marks for BTEC and 30 Marks for BSc)

a). Fig 1. shows the existing ground level on a 15 m square grid forming part of a site which was to be uniform formation level of 10 meters above the datum. Determine the volume of the earth to be excavated using rectangular shape **(10 Marks)**

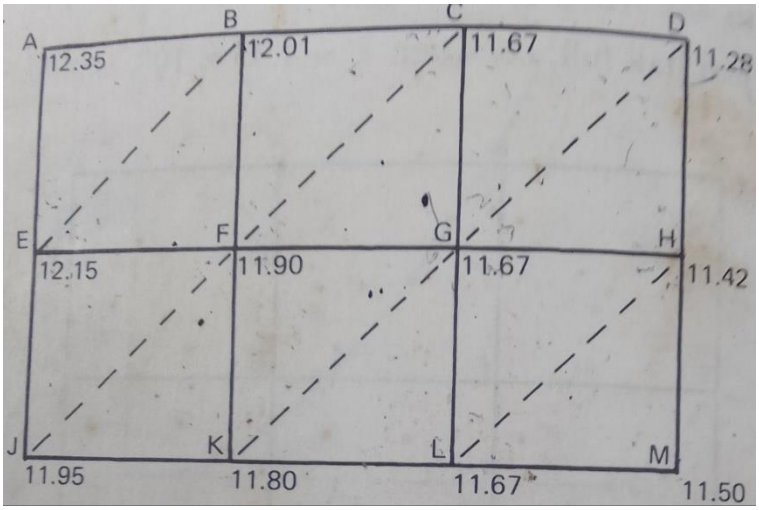

Fig. 1. Rectangular field

b). The figure below (Fig 2) shows details on Mass Haul Diagram, using the figures provided, determine the accumulated volume **(20 Marks).**

Chainage	Centre height (m)	Volume		Shrinkage Constant	Corrected volume	Accumulated volume
		Cut	Fill			
1000	F 1.22					
1040	0		230			
1100	C 1.52	480		0.9		
1200	C 3.96	2560		0.9		
1300	C 4.12	4560		0.9		
1400	C 2.4	3940		0.9		
1500	0	950		0.9		
1600	F 3.05		1350			
1700	F 4.24		4010			
1780	F 4.72		4600			
1820	F 4.72		BRIDGE			
1900	F 3.51		4130			
2000	F 1.22		2370			
2035	0		60			
2100	C 1.98	510		0.85		
2200	C 3.96	3180		0.85		
2300	C 3.66	4055		0.85		
2400	C 2.94	3860		0.85		
2500	C 0.61	1320		0.85		
2530	0	100		0.85		
2600	F 1.06		350			
2700	F 1.52		1230			
2800	0		420			
2900	C 1.86	1080		0.84		
3000	C 3.66	3720		0.84		

Fig 2. Quantities of Mass Haul Diagram

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO (20 Marks)

a). Using Simpson's rule, show that the area of an irregular figure is given by

$Area = \frac{x}{3}\ (X + 2O + 4E)$

$x = Intercept, X\ is\ the\ sum\ of\ the\ first\ and\ last\ offset,\ 2O\ is\ the\ sum\ of\ ODD\ offsets$

$4E\ is\ the\ sum\ of\ EVEN\ offsets.$ **(12 Marks).**

b). Using a sketch, derive formula for widths, and cross – sectional area of a section level across. Determine the side widths and cross – sectional area of an embankment toa road with formation width of of 12.5 m and side slope 1 vertical to 2 horizontals, when the centre height is 3.10 m and the existing ground has a cross fall of 1 in 12 at right to the centre – line of the embankment **(8 Marks).**

QUESTION THREE (20 Marks)

a). A road has a formation breadth of 9.5 m and side slopes of 1 in 1 cut, and 1 in 3 in fill. The original ground had a cross fall of 1 in 5. If the depth of excavation of the centre lines is 0.5 m, compute the side widths and the areas of cut and fill **(6 Marks).**

b). Calculate the area of a plot with the offsets, scaled from the plan at an interval of 10 m.

Offset:	O_1	O_2	O_3	O_4	O_6	O_7	O_8	O_9	O_{10}
Length (m):	5.9	12.4	16.5	15.3	18.4	20.9	24.24	21.8	19.2

(2 Marks).

c). Derive data for setting out the kerb line shown above in Fig 3. if the radius is 14, and angle TOU = 90°. The offsets are required at 2 m intervals **(8 Marks)**

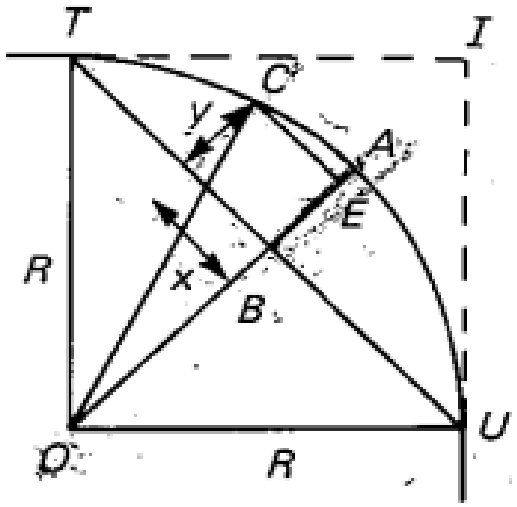

Fig. 3. Setting out of a simple circular curve

d). Discuss characteristics of a Mass Haul Diagram **(4 Marks)**

QUESTION FOUR (20 Marks)

a). A cutting is to be made in the ground which had a traverse slope of 1:5. The width of formation was 8.00 m and the side slopes are 1 vertical to 2 horizontals. If the depths of the centre lines of three sections of 20 metres apart were 4.50, 5.10 and 7.30 m respectively, compute the volume of the earth involved in this length of cutting (**12 Marks).**

b). The center line of a proposed railway conssists of two straights joined by a curve of 200-m radius. The angle of deflection between the two sfrtraights is 30° and the chainage (increasing from left to right) of the intersection is 2259.59 m. Determine the deflection angles to the nearest 20" using a chord length of 20 m **(8 Marks).**

QUESTION FIVE (20 Marks)

a). Determine the area of an irregular shape using the following coordinates

Station	E (m)	N(m)
A	150.0	300.0
B	206.98	385.65
C	168.55	282.02
D	192.93	248.80
E	191.74	185.70

(8 Marks)

b). Derive the components of a simple circular curve **(12 Marks).**