



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY

Department of BUILDING & Civil engineering

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING

TCV 4314 : ENGINEERING SURVEYING III

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: MARCH 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)

- a). Fig 1. shows a rectangular plot which is to be excavated to a given depth. Assuming that the sides are vertical, calculate the volume of the earth. The details were A (14.20), B (14.70), C (15.33), D (14.94), E (15.80), F (15.97), G (16.17), H (17.10) and J (15.67).

All the units are in meters, assume a formation level of 10 m above the datum. Determine the volume of the earth to be excavated using both rectangular and triangular shapes

(12 Marks)

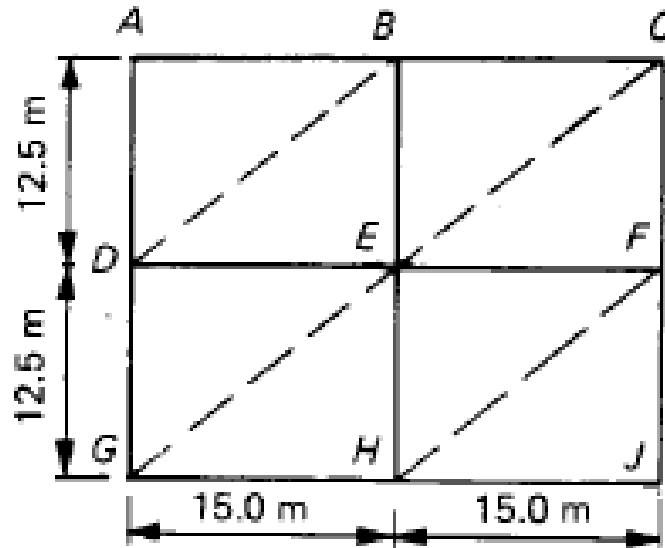


Fig. 1. Rectangular field

- b). The center line of a proposed railway consists of two straights joined by a curve of 200-m radius. The angle of deflection between the two straight lines 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)**.

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO (20 Marks)

- a). Using a sketch, derive Simpson's rule **(12 Marks)**.
- b). Derive equation for cross-section with equal widths. Compute the side widths and cross-sectional area of an embankment for a road with formation width of 12.5 m and side slope 1 vertical to 2 horizontal, 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 width of 9.50 m and side slopes of 1 vertical to 1 horizontal in cut and 1 vertical to 3 horizontal in fill. The original ground had a cross-fall of 1 vertical to 5 horizontal. If the depth of the excavation at the centre is 0.5 m, compute the side widths and areas of the 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 | 24.2 | 21.8 | 19.8 |
- (2 Marks)**.

- c). Derive data for setting out the kerb line shown above in Fig 4. if the radius is 14, and angle $\text{TOU} = 90^\circ$. The offsets are required at 2 m intervals
(8 Marks)

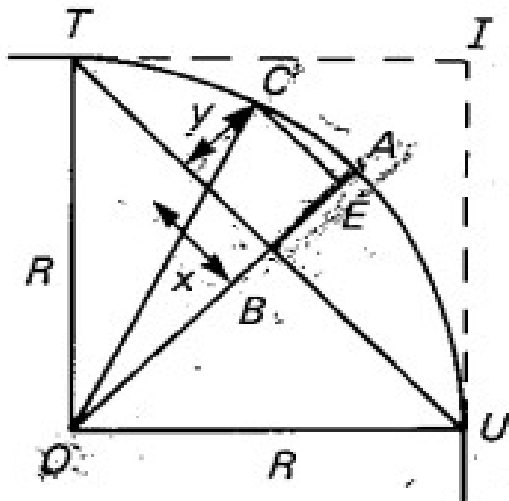


Fig 4. Setting out of curve

- c). Outline ANY four 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). A new access road to an old quarry necessitates an incline crossing an existing vertical quarry face, 9 m high, at right angles, the original ground being level above and below the face. A length of 120 m available on the low side is to accommodate the embankment forming the lower portion of the incline and it is desired to use spoil from cutting the higher ground to form this embankment in such a way that cut and fill balance. The cut has vertical sides and the material from each cubic metre filled 1.1 m^3 of the bank which has side slopes of 1 in 3. The formation breadth is 6 metres. Calculate the gradient required and the length of cutting. (8 Marks).
- c). Determine the area in hectares enclosed by the line of a closed traverse survey ABCDE from the following data

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)

QUESTION FIVE (20 Marks)

- a). Derive the components of a simple circular curve
- b). Discuss the functions of the following parts of a planimeter
 - i). Pole block
 - ii). Pole arm
 - iii). Tracing arm
 - iv). Measuring unit

(12 Marks).

(8 Marks).

