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TECHNICAL UNIVERSITY OF MOMBASA  
**Faculty of Engineering &  
Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR DECREE IN:

**BACHELOR OF SCIENCE IN CIVIL ENGINEERING (BSCE y3 s2)**

ECE 2306: ENGINEERING SURVEY III

**END OF SEMESTER EXAMINATION**

SERIES: APRIL 2015

**TIME ALLOWED: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*
- *Pocket Calculator*

This paper consists of **FIVE** questions. Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

Use neat, large and well labeled diagrams where required

This paper consists of **THREE** printed pages

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**Question One (Compulsory)**

- a) A cutting is to be made in ground which has a traverse slope of 1:5. The width of formation was provided as 9.00metres and the side slopes are 1 vertical to 2.5 horizontal. If the depths at the centerlines of three sections 30m apart were 4.50, 5.10 and 6.30m respectively, determine the volume of the earth involved in this length of the cutting. **(12 marks)**
- b) 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	300.00	400.00
B	406.98	485.00
C	468.55	382.02
D	492.93	348.50
E	391.74	285.70

If the chain, nominally 20m long used on the survey was later found to be 0.1m too long, what would be the corrected value for the area? **(8 marks)**

- c) A road has a formation breadth of 9.00m, 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 at the centre lines of two sections 20 metres apart are 0.4 and 0.6m respectively determine the volume of cut and fill over this length. **(6 marks)**

### Question Two

- a) The above figure shows a rectangular plot which is to be excavated to the given depth. Assuming the sides to be vertical, calculate the volume of earth to be excavated assuming that the area is subdivided into rectangular and triangles **(12 marks)**

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- b) Calculate the side widths and cross-sectional areas of an embankment to a road with formation width of 10.5m and side slopes 1 vertical to 2 1/2 horizontal, when the centre height is 2.75m and the existing ground has a cross-fall of 1 in 12 at right angles to the centre line of the embankment **(6marks)**
- c) Define the following terms as used in Mass Haul diagrams:
- (i) Mass Hand diagram
  - (ii) Shrinkage
  - (iii) Free-hand distance
  - (iv) Haul distance **(4 marks)**

### Question Three

- a) With the aid of a sketch, derive the elements of a simple curve **(8 marks)**
- b) Derive data for setting out a kerb line of radius 12m and deflection angle of 90° offsets are required at 2.00m interval **(8 marks)**

- c) In order to find the excavation required for a railway line cutting, cross-sections were taken at every 30.00m. As the ground surface was irregular, the cross-sections were plotted and their areas obtained by a planimeter. The results were as follows:

Chainage of section (m):	1860	1890	1920	1950	1980	2010	2040	2070	2100	2130	2170	2200
Area in m <sup>2</sup>	24	248	196	197	101	89	296	150	311	212	143	49

Calculate the volume of the excavation in m<sup>3</sup> using 'End Area and Prismoidal methods'  
(4 marks)

#### Question Four

- a) By use of a diagram/sketch, derive expressions for widths W1 and W2 and cross-sectional area of section with cross-fall. (12 marks)
- b) In a chain survey, the following offsets were taken to a fence from a chain line:

Chainage (m)	0	20	40	60	80	100	120	140	160	180
Offset (m)	0	5.6	10	9.53	11.68	13.5	10.75	6.57	1.89	0

#### Question Five

- a) Tabulate data needed to set out by a theodolite and a chain a circular curve of radius 600m to connect two straights having a deflection angle of 18° 24', the chainage of the intersection point (I) being 2140.00m (10 marks)
- b) Discuss any FOUR methods of determining an area of an irregular figure (10 marks)