TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BSC IN CIVIL ENGINEERING

ECE 2306: SURVEY III

END OF SEMESTER EXAMINATION

SERIES: APRIL2016

TIME: 2HOURS

DATE: 17May2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, Drawing Instruments, Scientific calculator, examination pass and student ID

This paper consists of five questions. Attemptquestion ONE (Compulsory) and any other TWO questions.

QUESTION ONE [30 Marks]

a) Describe the components of a planimeter.

[4 marks]

b) Describe a procedure for measuring area from a plan by a planimeter with the pole outside the figure.

[5 marks]

c) The plan area of a piece of land is 2420 square millimetres as measured by a fixed-arm planimeter. If the scale of the plan is 1/1250, calculate the actual area of the land in hectare.

[2 marks]

d) The following offsets were taken from a chain line to hedge:

Distance[m]	0	10	30	60	80	120	160	220	280
Offset [m]	9.4	10.8	13.6	11.2	9.6	8.4	7.5	6.3	4.6

Compute the area included between the chain lines, the hedge and the offset by:

i. Mid ordinate rule.
ii. Average ordinate rule.
iii. Simpson's rule.
iv. Trapezoidal.

[19 marks]

QUESTION TWO [20 Marks]

a) State and derive Simpson's Rule for determination of areas.

[5marks]

b) Derive a formula for determining area of a field by average ordinate rule.

[4 marks]

c) Derive a formula for determining area of a field by simple triangles.

[3 marks]

d) The following perpendicular offsets are measured from a straight line to an irregular boundary at regular intervals of 15 metres.

Offset	Distance (m)	Offset	Distance (m)	Offset	Distance (m)
H_1	8.25	H_6	13.60	H_{11}	20.05
H_2	13.85	H_7	15.25	H_{12}	15.90
H_3	12.25	H_8	16.85	H_{13}	12.25
H_4	10.85	H_9	14.95	H_{14}	12.00
H_5	12.25	H_{10}	17.35		

Compute the area lying between the straight line and the irregular boundary by:

i. Trapezoidal rule.
ii. Simpson's one third rule.

[8 marks]

QUESTION THREE [20 Marks]

a) Derive an expression for trapezoidal formula for volume.

[5 marks]

b) The areas within the contour line at the site of a reservoir and the face of the proposed dam are as follows:

Contour [m]	Area [m2]	Contour [m]	Area [m2]
101	1,000	106	1350,000
102	12,800	107	1985,000
103	95,200	108	2286,000
104	147,600	109	2512,000
105	872,500		

Take 101 as the bottom level of the reservoir and 109 as the top level. Calculate capacity of the reservoir by:

i. Trapezoidal rule.
ii. Prismoidal formula.

[8 marks]

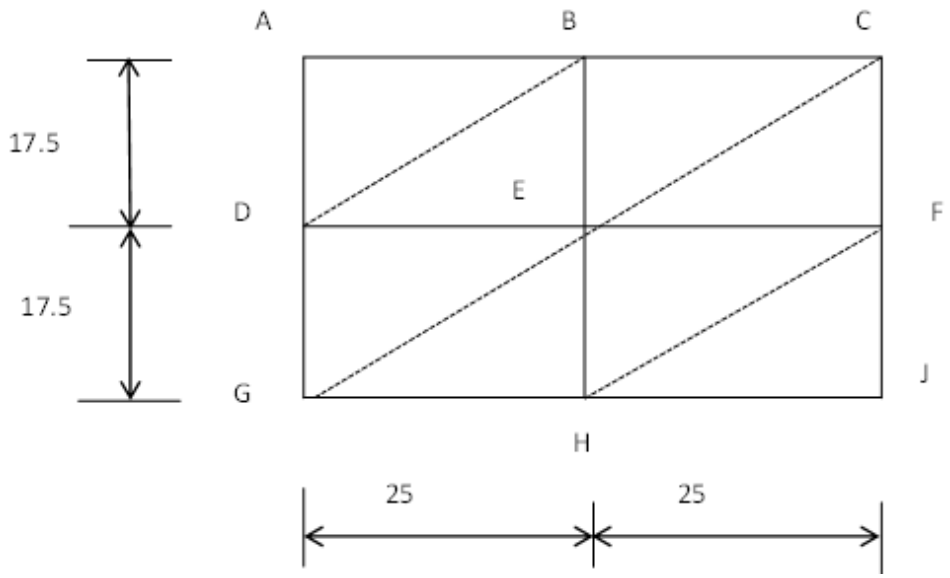
c) Describe the determination of volumes from spot levels.

[3 marks]

d) The figure below shows a rectangular plot which is to be excavated to the given depths. Assuming the sides to be vertical, calculate the volume of earth to be excavated.

Station	A	B	C	D	E	F	G	H	J
Depth of exc. [m]	4.15	4.70	5.33	4.94	5.80	5.97	6.17	7.10	4.67

[5 marks]



Dimensions in the figure are in metres

QUESTION FOUR [20 Marks]

a) Explain the following terms in respect to mass hall curve:
   i. Lift and lead in earthwork.
   ii. Free haul and overhaul.

[4 marks]

b) Describe a procedure of constructing a mass haul curve.

[5 marks]

c) Describe the characteristics of mass haul curves.

[6 marks]

d) An excavation is to be made for a reservoir 20 m long 12m wide at the bottom, having the side of the excavation slope at 2 horizontal to 1 vertical. Calculate the volume of excavation if the depth is 4metres. The ground surface is level before excavation.

[5 marks]

QUESTION FIVE [20 Marks]

a) Explain why a parabola is used as a vertical curve.

[2 marks]

b) With the aid of a sketch describe various types of vertical curves.

[6 marks]

c) Discuss the centrifugal effect in the design of vertical curve.

[8 marks]

d) What is meant by rate of change of grade on vertical curves and why it is important?

[4 marks]