TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR BACHELOR OF SCIENCE IN CIVIL ENGINEERING (BSCE)

ECE 2306: ENGINEERING SURVEYING III

END OF SEMESTER EXAMINATION
SERIES: AUGUST 2013
TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions.
Answer question **ONE (COMPULSORY)** in section **A** and any other **TWO** questions from section **B**
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

SECTION A

Question One (Compulsory)

a) Determine the area in hectares enclosed by the line of a closed traverse survey from the following data:

Station	E(m)	N(m)
A	200.00	300.00
B	306.98	385.65
C	368.55	282.02
D	395.93	278.80
E	200.74	185.70

If the chain used, nominally 20m long, used on the survey was later found to be 0.2m too long, what will be the corrected value for the area? **(10 marks)**

b) A cutting is to be made in the ground which has a traverse slope of 1:5. The width of formation is 10.00m and the side slopes are 1 vertical to 2 horizontal. If the depths at the centre lines of the three

sections 30m apart are 3.50m, 4.10m and 5.30m respectively, determine the volume of the earth involved in this length of cutting. **(10 marks)**

c) Tabulate the data required to set out by a chain and a tape a circular curve of radius 800m to connect two straights having a deflecting angle of 20° 24' 00". The chainage at the intersection of the tangent is given as 2240m and the interval of pegs is given as 20m apart. **(10 marks)**

SECTION B (Attempt any TWO questions)

Question Two

a) With an aid of a sketch, derive the elements of a simple curve. **(8 marks)**

b) In order to find the excavation required for a railway cutting, cross-sections were taken at every 40m. As the ground surface was irregular, the cross-sections were plotted and their areas obtained by using a planimeter. The results were as follows:

Chainage of section (m)	:	1840	1880	1920	1960
Area in m^2		34	296	348	201
Chainage of section (m)	:	2000	2040	2080	2120
Chainage of section (m)	:	2160	2200	2240	411
Area in m^2	:	189	243	149	

(i) Compute the volume of extraction in m^3 using both the end areas formula and prismoidal formula. **(10 marks)**

(ii) State which of the above answers you consider to be more accurate, give reasons. **(2 marks)**

Question Three

a) To calculate the side widths and cross-sectional area of an embankment to a road with a formation width of 13.50m, and side slopes 1 vertical to 2 horizontal, when the centre height is 4.10m and the existing ground has a cross-fall of 1 in 12 at right angles to the centre line of the embankment. **(3 marks)**

b) Discuss any FOUR methods used in determining areas of irregular figures citing their relevant formulas. **(10 marks)**

c) Calculate the area of a plot that has been scaled off from a plan at intervals of 20m given the following data:

Offset	O_1	O_2	O_3	O_4	O_5
Length (m)	16.76	19.81	20.42	18.59	16.76
Offset	O_6	O_7	O_8	O_9	O_{10}
Length (m)	17.68	17.68	17.37	16.76	17.68

(3 marks)

d) The area within the underwater contours are as follows:

Contour:	460	465	470	475	480	485	490
Area (m^2)	3000	8800	10500	20000	24500	15000	6000

Using both End Area and Prismoidal methods, calculate the volume of water in the lake between contours 460 and 490 **(4 marks)**

Question Four

a) Tabulate data needed to set out by theodolite and a chain a circular curve of radius 600m to connect two straights having a deflection angle at 18°24', the chainage of the intersection point being 2140.00m **(12 marks)**

b) Define the following terms as used in Mass Haul diagrams:
- **(i)** Free haul distance
- **(ii)** Average haul distance
- **(iii)** Borrow
- **(iv)** Waist **(8 marks)**

Question Five

a) The figure shown below is of a rectangular plot is to be excavated to a given depth. Assuming the sides to be vertical, calculate the volume of the earth to be excavated if:

(i) The area is subdivided in to four rectangles
(ii) If the area is divided into triangles **(10 marks)**

15.0

b) Discuss various parts of a planimeter. What is the area of a piece of land which has a plan area of $1613m^3m^2$ as measured by a fixed-arm planimeter if the scale of the plan is 1/2500 **(10 marks)**