

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

**UNIVERSITY EXAMINATIONS
2012/2013 ACADEMIC YEAR**

THIRD YEAR SECOND SEMESTER EXAMINATIONS

**FOR THE DEGREE OF
BACHELOR OF SCIENCE IN CIVIL & STRUCTURAL ENGINEERING**

**COURSE CODE: CSE 244
COURSE TITLE: ENGINEERING SURVEYING II**

DATE: NOVEMBER 2013

TIME: 3HOURS

INSTRUCTIONS TO CANDIDATES

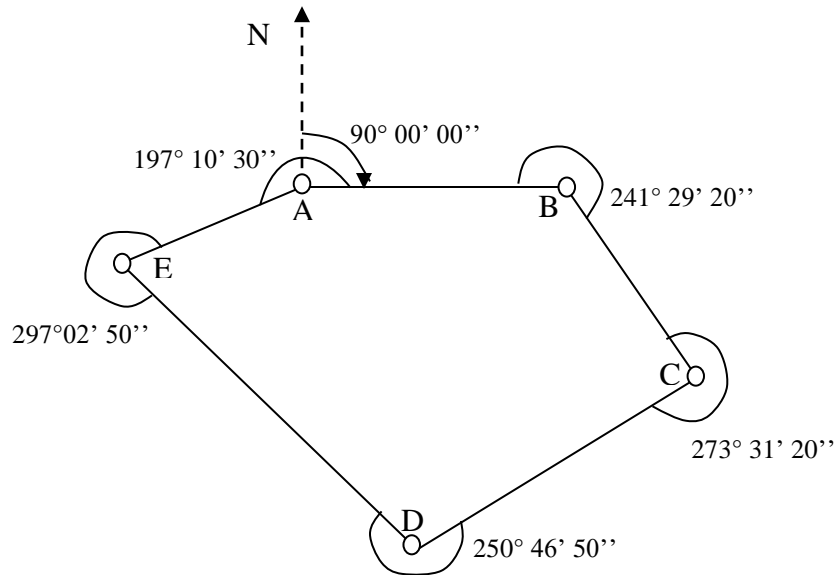
- This paper contains Five Questions
- ATTEMPT any FOUR Questions

QUESTION 1 (25 Marks)

(a) What is the basic difference between temporary and permanent adjustments of a theodolite? (5 Marks)

(b) What is a traverse? With the help of neat sketches differentiate between the various types of traverses. (8 Marks)

(c) The traverse shown is a field abstract for a polygon traverse ABCDEA. Calculate the adjusted coordinates of stations B, C, D, and E, adjusting any misclosure by the Bowditch method. The coordinates of station A are 500.00m E, 500.00m N and the line AB has an assumed whole circle bearing of $90^\circ 00' 00''$. The horizontal distances are shown in the table below. Also show the accuracy of the traverse. (12 Marks)



Line	Distance (m)
AB	355.98
BC	251.23
CD	429.63
DE	460.31
EA	245.50

QUESTION 2 (25 Marks)

(a) Outline THREE methods of optical distance measurement (tacheometry). (3 Marks)

(b) A vertical staff is observed with a horizontal external focussing telescope at a distance of 112.489 m. Measurements of the telescope are recorded as: objective to diaphragm (focal length of lens) is 230 mm and objective to instrument vertical axis is 150 mm. If the readings taken to the staff were 1.073, 1.629 and 2.185, calculate:

- (i) the distance apart of the stadia lines (*i*)
- (ii) the multiplying constant (*K*)
- (iii) the additive constant (*C*).

(6 Marks)

- (c) A tacheometer was set up at station A and the following readings were obtained on a vertically held staff.

Station	Staff station	Vertical angle	Hair readings	Remarks
A	B.M	- 2° 18'	3.225, 3.550, 3.875	R.L of B.M = 425.515m
	B	+ 8° 36'	1.650, 2.515, 3.380	-----

Calculate the horizontal distance from A to B and the reduced level (R.L) of B if the constants of the instrument are 100 and 0.4.

(10 Marks)

- (d) In relation to stadia tacheometry, outline
 (i) the sources of errors; and
 (ii) the areas of its application

(7 Marks)

QUESTION 3 (25 Marks)

- (a) Define a Total station and concisely explain how you would carry out an electronic calibration on a Total station

(8 Marks)

- (b) The height of an EDM setup at M is 1.385 m. The height of the reflector set up at P is 1.615 m. The height of the theodolite at M used to measure the vertical angle is 1.295 m. The height of the target at P on which the vertical sight is taken is 1.495 m. The slope distance after meteorological corrections is 1650.452m. The measured vertical angle is +3° 02' 32". What is the horizontal distance between M and P? (Use appropriate sketch)

(10 Marks)

- (c) In connection with setting out levels, differentiate between between a "sight rail", a "traveller" and a "slope rail"

(6 marks)

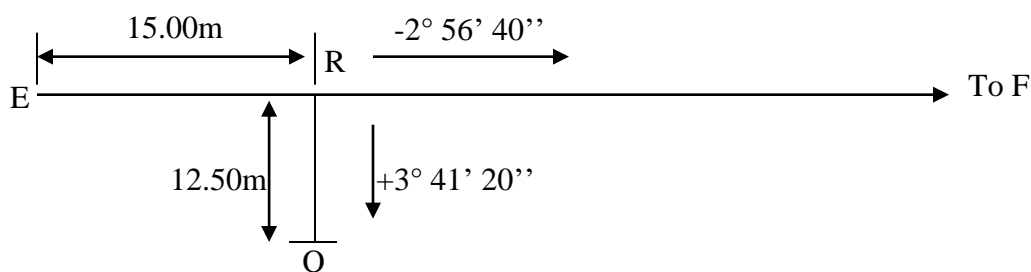
QUESTION 4 (25 Marks)

- (a) Explain the setting stakes along the centre line alignment in connection with the setting out works for highway, railway, dam and canal.

(6 marks)

- (b) A design point Q is to be set out from a control line EF using a theodolite and a steel tape as follows: Measure 15.00m horizontally from E along the line EF and establish a point R. From point R, turn off a right angle and measure a horizontal distance of 12.50m to establish point Q. The ground slopes uniformly from E to F at an angle of -2° 56' 40" and from R to Q at an angle of +3° 41' 20". Calculate the lengths along the ground surface that must be set out from E to fix the position of R and from R to fix the position of point Q. Plan view of the setting out scheme is shown below.

(4 Marks)



- (c) A sewer is to be laid at a uniform gradient of 1 in 200, between two points X and Y , 240 m apart. The reduced level of the invert at the outfall X is 150.82. In order to fix sight rails at X and Y , readings are taken with a level in the following order:

<i>Reading</i>	<i>Staff Station</i>
BS 0.81	TBM (near X), RL 153.81
IS 'a'	Top of sight rail at X
IS 1.07	Peg at X
FS 0.55	CP between X and Y
BS 2.15	CP between X and Y
IS 'b'	Top of sight rail at Y
FS 1.88	Peg at Y

- (i) Find the reduced levels of the pegs. (4 marks)
- (ii) If a boning rod of length 3 m is to be used, find the level readings a and b . (7 marks)
- (iii) Find the height of the sight rails above the pegs at X and Y . (4 marks)

QUESTION 5 (25 Marks)

- (a) Define the following terminologies as used in Mass Haul Diagrams (MHD):
- i. Haul
 - ii. Haul distance
 - iii. Freehaul and Overhaul
 - iv. Waste and Borow
- (7 marks)
- (b) Discuss briefly three methods commonly used to compute the volume of earthworks. (6 marks)
- (c) The following cross-section notes give the staff readings and corresponding side slope limits of three "three-level" sections taken from one position of the level.

Chainage	Left	Centre	Right
800	0.48/ 4.32	1.74/ 0	2.68/ 4.62
820	1.84/ 5.40	2.94/ 0	3.42/ 4.66
840	1.16/ 4.86	2.34/ 0	3.05/ 4.64

If the formation width is 8 m, calculate the content of this length using the end areas method and correcting for prismatic excess.

(13 marks)