



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

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR**

**SECOND YEAR SECOND SEMESTER SUPPLIMENTARY
EXAMINATIONS**

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

COURSE CODE: CSE 244

COURSE TITLE: ENGINEERING SURVEYING II

DATE: 04/08/2022

TIME: 8.00 – 10.00AM

INSTRUCTIONS:

1. This paper contains **FOUR** questions
2. Answer any **THREE** questions
3. Marks for each question are indicated in the parenthesis.
4. Examination duration is **2 Hours**

MMUST observes **ZERO** tolerance to examination cheating

This Paper Consists of 5 Printed Pages. Please Turn Over.

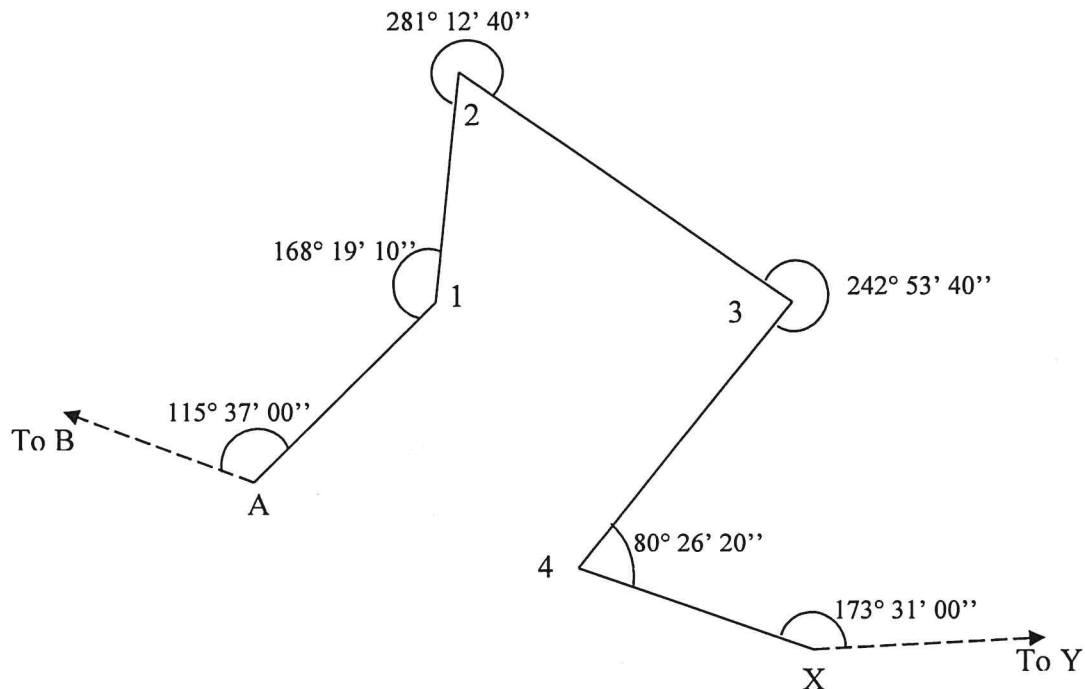
QUESTION 1 (25 Marks)

- (a) The standard errors of a single measurement of length by an EDM instrument was given as $\pm 1.5\text{mm}$ and $\pm 3\text{mm/km}$. What are the errors 1.5mm and 3mm called? What is the overall standard error of a measurement of 1500m made by the same EDM? (4 Marks)
- (b) Explain the principles of electronic distance measurements (4 Marks)
- (c) State any four sources of error that are likely to occur when using a Total station (5Marks)
- (d) An EDM slope distance PQ is determined to be 1246.88m. The EDM is 1.74m above its station P and the prism is 1.83m above its station Q. The EDM is mounted on a theodolite whose optical center is 1.71m above the station. The theodolite was used to measure the vertical angle ($-3^\circ 18' 20''$) to a target on the prism pole. The target is 1.49m above the station Q. Compute:
 • the horizontal distance PQ
 • the elevation of STN Q given that the elevation of STN P is 186.275m.
 (use appropriate sketch) (12 Marks)

QUESTION 2 (25 Marks)

- (a) With the aid of suitable diagrams, explain the differences between the following terms used in engineering surveying:
 (i) A “polar computation” and a “join computation”
 (ii) An “open” traverse, a “closed” traverse and a loop traverse (10 Marks)
- (b) A link traverse was run between stations A and X as shown in the traverse diagram below. The coordinates of the control stations at the ends of the traverse are as follows

	E (m)	N (m)
A	1769.15	2094.72
B	1057.28	2492.39
X	2334.71	1747.32
Y	2995.85	1616.18



Given the lengths of the traverse legs as shown in the table below, calculate the coordinates of stations 1,2,3,4, adjusting any misclosure by the bowditch method.

Line	Distance (m)
A1	208.26
12	193.47
23	326.71
34	309.15
4X	224.79

(15 Marks)

QUESTION 3 (25 Marks)

- (a) Describe how you would concisely level a theodolite in preparation for angle readings during tachometric work in the field

(7 Marks)

- (b) In a tacheometric traverse, of which the first three stations are *A*, *B* and *C*, at station *B* it is found that the instrument height had not been measured above the peg *A*. Find from the tabulated readings the missing instrument height and the reduced level of the ground at *C*, if that at *A* is 83.44m. The instrument constants are 100 and 0.

Station	point	Verticle circle reading	stadia readings	Height of instrument (m)
A	B	+5° 42'	2.43, 2.07, 1.71	?
B	A	-5° 24'	1.68, 1.34, 1.00	1.28
B	C	-5° 24'	1.68, 1.44, 1.20	1.28

(10 Marks)

(c) In relation to stadia tacheometry, outline

- (i) the sources of errors; and
- (ii) the areas of its application

(8 Marks)

QUESTION 4 (25 Marks)

- (a) In connection with setting out levels, differentiate between a “sight rail” and a “traveller” (4 marks)
- (b) Using suitable diagram, explain how the rails in (a) above can be used to monitor cutting and filling in road construction (6 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. (5 marks)
- (ii) If a boning rod of length 3 m is to be used, find the level readings a and b . (6 marks)
- (iii) Find the height of the sight rails above the pegs at X and Y . (4 marks)