(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITRY EXAMINATIONS 2022/2023 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER EXAMINATIONS

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

COURSE CODE: CSE 241

COURSE TITLE: ENGINEERING SURVEYING I

DATE: 13TH DECEMBER 2022 **TIME: 8 – 10 A.M.**

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 4 Printed Pages. Please Turn Over.

QUESTION 1 (25 Marks)

a) Define engineering surveying and state its main role.
(4 marks)

b) Apart from Engineering Surveying, there are FOUR other main branches of Land Surveying. Describe these branches. (8 marks)

c) Differentiate between the following terms as used in surveying:
(i) a plan and a map
(ii) precision and accuracy
(iii) a mistake and an error
(iv) a Level and a Total Station (8 Marks)

d) The two sides of a rectangle were measured as x = 32.543 ± 0.010 m and y = 17.298 ± 0.020 m. calculate the area of the rectangle and its standard error.
(5 marks)

QUESTION 2 (25 Marks)

(a) A chain line AB on an evenly sloping ground was measured with a 30-metre band and found to be 125.510 m long. After completing the survey, the band was checked and found to be 0.025 m longer than its nominal length. Given that the difference in height between the two points A and B was 6.720 m, compute the horizontal distance AB.
(7 marks)

(b) Deduce that the sea level correction ∂l, for a distance, L measured at an altitude, h above the mean sea level can be obtained from:

$$\delta l = \frac{Lh}{R+h}$$ where, R is the mean radius of the earth. (6 marks)

(c) A steel tape of nominal length 30 m was used to measure the distance between two points A and B on a structure. The following measurements were recorded with the tape suspended between A and B:

Line	Length measured	Slope angle	Mean Temperature	Tension applied
AB	29.872 m	3^0 40'	5^0	120 N

The standardized length of the tape against a reference tape is 30.014 m at 20^0 C and 50 N tension. The tape weighs 0.17 NM^{-1} and has a cross-sectional area of 2 mm^2, coefficient of linear expansion of 0.0000112 per °c and Young's modulus of elasticity as 2 x 10^5 N/mm^2 Calculate the horizontal length of AB.
(12 marks)

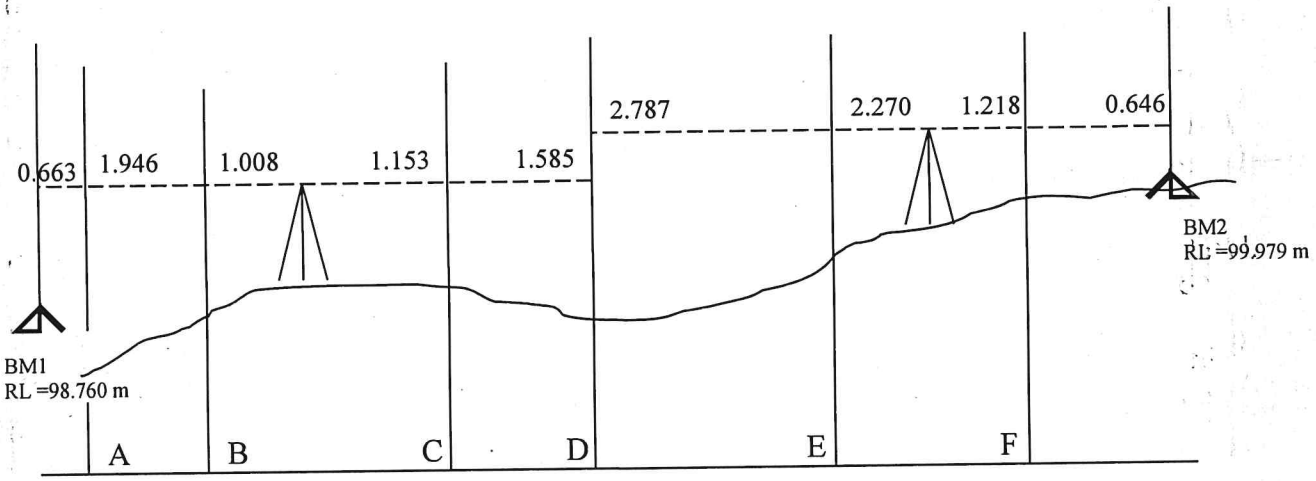
QUESTION 3 (25 Marks)

(a) Explain the difference between the following terms as used in levelling:
(i) "Level surface" and "Level line"
(i) "Horizontal plane" and "Horizontal line"
(ii) "Backsight" and" Foresight"
(iii) "Intermediate Sight" and "Change Point"

(8 marks)

(b) Using neat sketches describe how you would perform level tube adjustment in a dumpy level.
(7 Marks)

(c) Levelling was done down the centre line of a road for the purpose of production of a longitudinal section and this is shown schematically below with the level readings marked thereon.



Determine the reduced levels at the various staff stations by the Rise and Fall Method, applying the necessary arithmetical checks.

(10 marks)

QUESTION 4 (20 Marks)

a) Define reciprocal levelling and state when it may be necessary (6 Marks)

b) Why is it necessary to try and keep sight lengths as equal as possible when leveling?
(2 marks)

c) The readings obtained from a Two-Peg Test carried out on an automatic level with a single level staff set up alternately at two pegs *A* and *B* placed 50 m apart were as follows:

With the level midway between *A* and *B*

Staff reading at *A* = 1.283 m

Staff reading at *B* = 0.860 m

With the level positioned 5 m from peg *B* on the line *AB* produced

Staff reading at *A* = 1.612 m

Staff reading at *B* = 1.219 m

Calculate

(i) The collimation error of the level per 50 m of sight

(ii) The reading that should have been observed on the staff at *A* from the level in position 5 m from *B*.

(6marks)

d) In order to determine the minimum clearance between a road running generally in the north-south direction and the underside of a bridge, a series of levels were taken as shown in Table 1. Reduce the readings by the Height of Collimation method, applying the usual checks, and determine the minimum clearance.

(12 Marks)

Table 1*(All readings in metres)*

BS	IS	FS	REMARKS
0.150			BM (RL = 59.61 a.s.l)
0.219		3.152	CP
	3.127		West edge of road
	-0.862		*Underside of bridge, Inverted Staff
	2.858		Road centreline
	-0.868		*Underside of bridge, Inverted Staff
	2.872		East edge of road
	-0.802		*Underside of bridge, Inverted Staff
3.566		0.478	CP
		0.305	BM (RL = 59.61 a.s.l)

**Refers to point vertically above the previous point.*