



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

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2023/2024 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: 7/12/2023

TIME: 8.00AM -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 4 Printed Pages. Please Turn Over.

QUESTION 1 (25 Marks)

- (a) Define engineering surveying. (2 marks)
- (b) Explain the main purposes of engineering surveying by dividing the surveying process into three basic stages. (9 marks)
- (c) With reference to survey measurements and observations, differentiate between the following:
 Precision and Accuracy
 Systematic error and random error
 Level and Total station (6 Marks)
- (d) State the principles involved in choosing stations for a chain and tape survey (8 Marks)

QUESTION 2 (25 Marks)

- (a) Describe with the aid of a diagram the method you would use when chaining a line that runs across a hill such that the visibility between the two end points are obscured. (6 marks)
- (b) List SIX types of corrections that are normally applied to a distance measurement in catenary, quoting the equation used in each case. (6 Marks)
- (c) A 30m steel tape measured 30.015 m when standardized fully supported under a 70 N pull at a temperature of 20°C. The tape weighed 0.90kg (9N), had a cross sectional area of 0.028mm², coefficient of linear expansion of 0.0000115 per °c, and Young's modulus of elasticity as 21 x 10⁶ N/mm². What is the true length of the recorded distance AB for the following condition? (Assume all full tape lengths except in the last one)

<i>Recorded distance AB</i>	<i>Average Temperature</i>	<i>Means of support</i>	<i>Tension</i>	<i>Elevation difference per 100m</i>
114.095m	12°	Suspended	100 N	2.5m

(13 Marks)

QUESTION 3 (25 Marks)

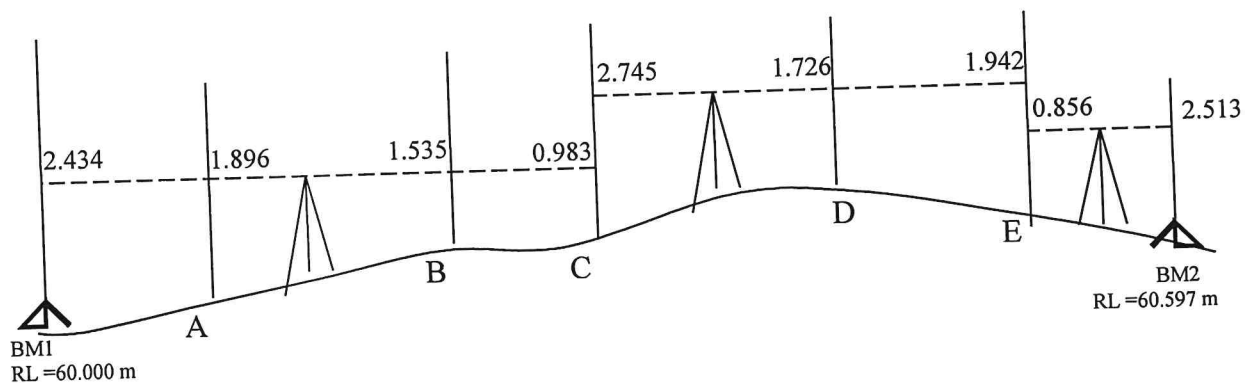
(a) Explain the difference between the following terms as used in levelling:

- (i) "Level surface" and "Level line"
- (ii) "Datum surface" and "Bench mark"
- (iii) "Backsight" and "Foresight"
- (iv) "Spot Height" and "Contour"
- (v) "Intermediate Sight" and "Change Point"

(10 marks)

(b) Why is it necessary to try and keep sight lengths as equal as possible when leveling? (2 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. (14 marks)

QUESTION 4 (25 Marks)

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

b) 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)
- (c) The under noted readings in meters on a leveling staff were taken along a roadway AB with a dumpy level, the staff being held in the 1st case at a starting point A and then at 20m intervals: 0.765, 1.064, [0.616], 1.835, 1.524. The level was then moved forward to another position and further readings were taken. These were as follows; the last reading being at B: 2.356, 1.378, [2.063], 0.677, 2.027. The level of A is 41.819m. Set out the readings and complete the bookings using the Height of Collimation method. Calculate the gradient from A to B. (Figures in brackets denote inverted staff readings). (13 Marks)