



# TECHNICAL UNIVERSITY OF MOMBASA

---

SCHOOL OF ENGINEERING AND TECHNOLOGY  
DEPARTMENT OF BUILDING & CIVIL ENGINEERING  
**UNIVERSITY EXAMINATION FOR:**  
BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING  
BACHEROR OF SCIENCE IN CIVIL ENGINEERING  
**TCV 4214 and ECV 4214: ENGINEERING SURVEY 1**  
END OF SEMESTER EXAMINATION  
**SERIES: JANUARY 2025**  
**TIME: 2 HOURS**

## **Instructions to Candidates**

You should have the following for this examination

*-Answer Booklet, examination pass and student ID*

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

**Do not write on the question paper.**

---

## **QUESTION ONE (COMPULSORY) (30 MARKS).**

a) You have been asked to take the dumpy level from the Survey Lab, Technical University of Mombasa and carryout levelling work starting at Gate A all along to Gate B. Assuming bellow shown, is the staff readings and the reduced level at point A, which is 0 distance to B, 500 m away and recorded in the field book. Do the following.

- (i) Calculate and fill the Rise, Fall and Reduced level columns.
- (ii) Apply checks

**(10 Marks)**

B. S	I.S	F. S	Rise	Fall	Reduced Level	Distance(m)	Remarks
3.125						0	A Ground level
	2.975					100	S <sub>1</sub>
0.875		2.185				200	S <sub>2</sub>
	2.015					300	S <sub>3</sub>
1.265		1.755				400	S <sub>4</sub>
		1.845				500	B Ground level

- b). State and explain types of errors that are encountered when carrying out linear surveying and measures taken to ensure that they are minimized (correction). **(10 Mark)**
- c) Define the word reconnaissance and explain the purpose of carrying out reconnaissance before surveying is conducted. **(10 Marks)**

**QUESTION TWO (20 MARK)**

- a). Explain the meaning of the following surveying words as used in booking, when writing the field book. **(10 Marks)**.
- (i) Backsight
  - (ii) Foresight
  - (iii) Intermediate sight
  - (iv) Reduced level
  - (v) Change points **(10 Marks)**
- b). Discuss Pythagorean Theorem as applied in linear surveying **(10 Marks).**

**QUESTION THREE (20 MARKS)**

- a). With an aid of a sketch name parts of a tilting level **(10 Marks)**
- b). Discuss the factors that must be considered during the process of reconnaissance survey **(10 Marks)**

**QUESTION FOUR (20 MARKS)**

- a) Define the following word
- (i) Contour
  - (ii) Reciprocal levelling **(4 Marks)**
- b) State the characteristics of contour lines **(6 Marks)**
- c) Reciprocal levelling observation is made in both directions to eliminate the effect of refraction and the curvature of the earth; explain by giving an example. **(10 marks)**

**QUESTION FIVE (20 MARKS)**

- a). In levelling across a river, reciprocal levelling observations gave the following results for the staff held vertically at points X and Y from level stations A and B on each bank respectively.

Level at point X, the height of collimation was 1.650 m

The reading of the Staff on Y was 1.635 m.

Level at point Y, the height of collimation was 1.632m.

The reading of Staff on X was 1.625 m.

Determine the reduced level of Y if the reduced of X was 7.04 m A.O.D, and the collimation error of the instrument **(4 Marks).**

- b). Show that curvature and refraction combined is given by the following expression:  
 $C\&R = 0.673 L^2$  where  $L$  is in Kilometres **(14 Marks).**
- c). What is an offset? **(2 Marks).**