



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR

BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING
TCV 4214: ENGINEERING SURVEY -I

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: MARCH 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

-Drawing instruments.

This paper consists of five questions.

Attempt any THREE questions.

Do not write on the question paper.

QUESTION ONE (Compulsory) (20 Marks).

- a). You have been given the task of conducting linear surveying. Along your survey line, you encounter a big river. Discuss any method of overcoming obstruction (6 Marks).
- b). The groups of figures below refer to staff readings taken with a level from instrument stations, A, B, C, D and E. The first and the last readings in each group are the backsight and foresight respectively. The backsight from station A was taken with the staff held on a bench mark at 204.11m above the datum. A (2.680, 0.875, 0.980, 0.430; B (1.665, 1.440, 0.625); C (1.010, 1.690, 1.225); D (2.445, 3.575, 3.880, 2.280); E(2.735, 2.005, 2.390) 14 Marks).

ANSWER ANY QUESTION FROM THIS SECTION

QUESTION TWO (20 Marks).

- a). A 30 m bay of a baseline was measured using a 30 m steel band that had been standardized in a catenary at a tension of 65 N and a temperature of 20°C. The following information was obtained:

- Applied tension = 90 N
- Temperature in the field = 15°C
- The radius of Earth's curvature = 6370 000- m
- The differences in height between the two points = 0.62 m
- The altitude of the base = 2000 m above sea level
- Cross-sectional area of the tape = 3.6 mm²
- Young Modulus of Elasticity (E) = 2.1×10^{11} N/mm²
- Coefficient of Linear Expansion (α) = $11 \times 10^{-6}/^{\circ}\text{C}$
- Mass of the tape = 0.036 Kg/m

Determine the five-correction applied on the steel tape (12 Marks).

- b). Derive the equation for curvature and refraction combine given by the following:

$$C \wedge R = 0.0673 L^2$$

Where:

L = is the length of sight $\in$ Kilometres (8 Marks).

QUESTION THREE (20 Marks).

- a). Discuss factors affecting the choice of vertical intervals in contouring (6 Marks).
- b). Giving examples, discuss gross error as in levelling (10 Marks)
- c). Two points X and Y were 700 m apart. A level was set up at X and Y in turn and the following readings were taken: Level at X. Height of Collimation read 1.708 m. Reading of the staff on Y was 1.695 m. Level at Y. Height of Collimation read 1.625 m. Reading of the on X was recorded as 1.675 m. Calculate the reduced level of point Y if the reduced level of X is 100.04 m A.O. D (4 Marks).

QUESTION FOUR (20 Marks).

- a). Discuss the process of Pythagorean Theorem of obtaining right angles (12 Marks).
- b). Define the following terms as used in levelling
- i). Back Sight (B.S)
 - ii). Fore Sight (F.S)

- iii). Reduced level (R.L)
- iv). Change Point (C.P)

(8 Marks).

QUESTION FIVE (20 Marks).

- a). Outline the process of reconnaissance **(5 Marks).**
- b). Discuss ANY five application of cross - sections **(5 Marks).**
- c). Make short notes under the following equipment
 - Tapes
 - Chains
 - Ranging rods
 - Marking arrows
 - Clinometer

(10 Marks).