



ZIMBABWE

**MINISTRY OF HIGHER AND TERTIARY EDUCATION,
INNOVATION, SCIENCE AND TECHNOLOGY
DEVELOPMENT**

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL CERTIFICATE

IN

CIVIL ENGINEERING

MODULE: Engineering Survey

PAPER NO: 313/22/M04

DURATION: 3 Hours

NOVEMBER/DECEMBER 2025 EXAMINATION

REQUIREMENTS

Scientific calculator

INSTRUCTIONS TO CANDIDATE

- 1) Answer any four (4) questions.
- 2) All questions carry equal marks.
- 3) Do not write anything on question paper.
- 4) Do not tear any page from booklet.
- 5) Do not write your name anywhere.

This paper consists of 3 printed pages.

QUESTION 1

- a) Write short notes on the following terms used in surveying:
- i) Land survey (3 marks)
 - ii) Collimation error (2 marks)
 - iii) Misclosure (2 marks)
 - iv) Levelling (2 marks)
 - v) Refraction (2 marks)
- b) Differentiate geodetic and plane surveying. (4 marks)
- c) Differentiate between surface and step taping. (4 marks)
- d) Outline any six (6) types of errors likely to be encountered during taping operations. (6 marks)

QUESTION 6

The following staff readings were observed (in the order given) when levelling up a hillside from BMA (135.200m) to BMB (155.369m) Excepting the staff position immediately after BMA each staff position was higher than the preceding one. 1.408; 2.728; 1.856; 0.972; 3.789; 2.749; 1.597; 0.405; 3.280; 2.012; 0.625; 4.136; 1.597; 0.405; 3.280; 2.012; 0.625; 4.136; 2.664; 0.994; 3.901; 1.929; 3.478; 1.332.

Book the readings in a level book and reduce using rise and fall method and apply all necessary corrections and arithmetic checks. (25 marks)

QUESTION 3

- a) Write brief notes on any three (3) methods used to determine area on a plan. (12 marks)
- b) Briefly describe the use of a theodolite for checking the verticality of a column form work prior to casting concrete. (7 marks)
- c) Explain the advantages and disadvantages of using optical distance measurement as compared to direct methods. (8 marks)

QUESTION 4

- a) Calculate MSLD of line AB of the following data.

line	Measured distance (m)	Zenth angle	Field temp	Field tension	Catenary
AB	87.250	91°31'	28°C	10kg	4

Tape details

Standard temperature	21°C
Standard tension	7kg
Mass per metre	=0.024kg
Youngs modulus of elasticity	= $200 \times 10^9 \text{NM}^{-2}$
Cross-sectional area of tape	= 0.05cm^2
Coefficient of thermal expansion	= $1.17 \times 10^{-5} / ^\circ\text{C}$
Mean height above MSL of inne	AB=1.5km
Mean radius of the earth	AB=6361.1km
1kg force	9.81N

(20 marks)

- b) Outline five (5) pieces of equipment used in taping. (5 marks)

QUESTION 5

- a) Describe properties of Gauss and UTM coordinate systems. (10 marks)
- b) Write brief notes on the following:
- i) Longitudinal section. (5 marks)
 - ii) Cross section (5 marks)
- c) Outline uses of contour maps and plans (5 marks)

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