



ZIMBABWE

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

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL CERTIFICATE

IN

CIVIL ENGINEERING

SUBJECT: Engineering Survey

PAPER NO: 313/22/M04

DURATION: 3 Hours

MAY/JUNE 2025 EXAMINATION

REQUIREMENTS

1. Scientific calculator
2. Booklet

INSTRUCTIONS TO CANDIDATE

1. Answer all questions.
2. All questions carry equal marks.
3. Do not write anything on question paper.
4. Do not tear pages from answer booklet.
5. Do not write your name anywhere.

QUESTION 1

a) Write briefly on the following:

- i) Datum (2 marks)
- ii) Horizontal line (2 marks)
- iii) Level line (2 marks)
- iv) Reduced level (2 marks)
- v) Benchmark (2 marks)

b) Reduce the following levelling field book and perform all necessary checks using the rise and fall method.

BS	IS	FS	RL	Remark
1.5			60.5	1A
	2.5			2A
	4.0			3A
3.0		2.0		4A CPI
	5.5			2B
6.0		1.0		3B CP2
		3.0	65	2C

(15 marks)

QUESTION 2

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 sections (5 marks)

c) Outline uses of contour maps and plans. (5 marks)

QUESTION 3

Calculate MSLD of the line BC given the following data:

Line	Measured Distance	Zenith Angle	Field Temp	Field Tension	Catenary
BC	75.629m	91° 31'	26°C	150N	4 bays

Tape Details

Standard Temperature

= 18°C

Standard Tension

= 120N

Mass per metre

= 0.024kg

Young Modulus

= $200 \times 10^9 \text{Nm}^{-2}$

Cross sectional area of the tape

= 0.05cm^2

Coefficient of expansion

= $1.17 \times 10^{-5}/^\circ\text{C}$

Mean height of the Line BC

= 1.5km

Mean radius of the earth

= 6361.1km

(25 marks)

QUESTION 4

a) Distinguish between the following:

i) Accuracy and precision

(4 marks)

ii) Error and correction

(4 marks)

b) Briefly explain the three (3) types of errors found in surveying.

(9 marks)

c) Outline the four (4) stages involved when plotting a longitudinal section.

(8 marks)

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