



ZIMBABWE

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

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL CERTIFICATE

IN

**CIVIL ENGINEERING, IRRIGATION ENGINEERING, SURVEYING AND
GEOMATICS, CARTOGRAPHY**

SUBJECT: Engineering Surveying I PAPER NO: 363/18/S07

DURATION: 3 Hours

MARCH / APRIL 2022 EXAMINATION

REQUIREMENTS

- 1) Answer Booklet.
- 2) Scientific calculate.

INSTRUCTIONS TO CANDIDATE

Answer any FIVE (5) questions.

QUESTION 1 (20 MARKS)

- a) Explain the following methods of measuring horizontal distance:
- (i) Odometer (2 marks)
 - (ii) Taping (2 marks)
 - (iii) Tacheometry (2 marks)
 - (iv) E.D.M (2 marks)
 - (v) Pacing (2marks)
- b) Briefly describe a join polar. (4 marks)
- c) Given the following coordinates of A and B calculate the distance and direction from A to B.

Y	X
A+4730.521	+ 5960,610
B+5140.995	+6560.887 (6 marks)

QUESTION 2 (20 MARKS)

- a) Describe reciprocal levelling, with the aid of a diagram. (5 marks)
- b) Explain how you would you carry out collimation adjustment of the fitting level by the two peg test. (8 marks)
- c) A plan plotted to of 1:1000 was found to have shrunk causing a line plotted 256mm long to now measure 253mm. An area measured on the plan was found to be $278mm^2$. Calculate the true ground area. (5 marks)
- d) Define:
- (i) Reduced level (1 mark)
 - (ii) Benchmark (1 mark)

QUESTION 3 (20 MARKS)

A page of an old level book had been damaged by ants and the readings marked 'a' are missing. Find the missing readings with the help of available readings and apply check.

Chainage	B/S	IS	FS	HPC	RL	Remarks
	a			a	209.510	BMA
0		1.075			a	Peg 1
30		a			210.425	Peg 2
60		3.355			209.080	Peg 3
a	0.840		a	a	a	CP

PAPER NO: 363/18/S07-ENGINEERING SURVEYING

120		a			208.275	Peg 4
150		a			210.635	Peg 5
a	a		2.630	a	a	CP
210		a			206.040	Peg 6
240		1.920			205.895	Peg 7
270			a		205.690	Peg 8

(20 marks)

QUESTION 4 (20 MARKS)

a) Define

- (i) Traversing (3 marks)
- (ii) Ring traverse (1 mark)
- (iii) Polar (1 mark)

b) A theodolite traverse PABQ was carried out around a hillside to connect stations P and Q. The horizontal lengths were:

$$PA = 175.29 \text{ m}$$

$$AB = 316.78 \text{ m}$$

$$BQ = 98.15 \text{ m}$$

The horizontal angles measured clockwise from the back station were:

$$P\hat{A}B = 117^\circ 48' 20''$$

$$A\hat{B}Q = 132^\circ 21' 40''$$

$$\overrightarrow{PA} = 255^\circ 34' 00''$$

Calculate the length and bearing of PQ. Assume coordinates of P are (0;0).
(15 marks)

QUESTION 5 (20 MARKS)

a) Describe the following types of coordinate system:

- (i) Polar coordinate system (3 marks)
- (ii) Rectangular coordinate system (3 marks)
- (iii) Geographical coordinate system (3 marks)

b) Distinguish the difference between UTM and Gauss conformal coordinate system.
(10 marks)

c) Analyse the difference between universal theodolite and engineering theodolite.
(1 mark)

QUESTION 6 (20 MARKS)

- a) Write down the sources of errors in levelling due to manipulation. (3 marks)
- b) State the uses of contour maps/plans. (5 marks)
- c) Define a radian with the aid of a diagram. (2 marks)
- d) Calculate the area enclosed by the quadrilateral ABCD using the coordinate method:

A	+420.00	+1296.00	
B	+898.00	+1452.00	
C	+1026.00	+1964.00	
D	+688.00	+646.00	(6 marks)

- e) Describe systematic errors. (4 marks)
-/nk**