



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF TECHNICAL AND ENGINEERING EDUCATION AND
TRAINING

PTE:2157 CONSTRUCTION SURVEY

Main Examination

November 2024

This examination paper consists of FIVE (5) printed pages

Time allowed:	3 hours
Total marks:	100
Special Requirements:	NIL
Examiner:	Mr. A. Sithole
External Examiner:	Dr. Kahanji

INSTRUCTIONS

1. Answer any **FOUR** questions.
2. Sub-division marks are shown in brackets
3. Begin each question on a fresh page and number it.
4. Unless otherwise stated, all dimensions are in millimetres. Dimensions not given are left to your discretion.
5. Credit will be given for accuracy, legibility and neatness.

MARK ALLOCATION

QUESTION	MARKS
1	25 marks
2	25 marks
3	25 marks
4	25 marks
5	25 marks
6	25 marks

Question 1.

- a) Define the term Surveying [2marks]
- b) Distinguish between Levelling and Spirit levelling [5marks]
- c) Reduce the following measurement of a line AB, made with 100m tape, to mean sea level.

Line A-B	Measured length (L)	Zenith Angle	Temperature °C	Tension	Number of Bay
	99.874	87° 40"	27°C	10Kg F	3
	99.945	93° 50"	28°C	9Kg F	3
	61.621	94° 10"	28°C	7Kg F	2

Tape Details:

Mass per unit length = 0.024Kg/m

Standard Temperature 14°C

Standard tension 7KgF

Cross-Sectional is $3.2mm^2$

The coefficient of linear expansion is $1.18 \times 10^{-5} / ^\circ C$

Modulus of elasticity $2.11 \times 10^6 \text{ Kg/cm}^2$

Mean height above, mean sea level 2260 m. The mean radius of the earth is 6381100m. [18marks]

Question 2

- a) i. Construction Survey [2marks]
- ii. Engineering Surveying [2marks]
- iii. Cadastral Surveying [2marks]
- iv. Triangulation [2marks]

v. Global Position System (GPS)

[2marks]

- b) A stream of width 30.00 m is measured for depth at an interval of 5.00 m across its width.

Distance from bank (m)	0	5.00	10.00	15.00	20.00	25.00	30.00
Depth (m)	0	0.90	1.70	2.70	2.30	1.20	0

Determine the cross-sectional area of the flow of water in this stream using

Simpson's rule.

[5marks]

- c) Calculate the area enclosed by the quadrilateral A.B. C. D. with the following coordinates [10marks]

Station (s)	Y(m)	X(m)
A	+420	+1296
B	+898	+1452
C	+1026	+1064
D	+688	+646

Question 3

- a) i. Define the term "Parallax" [2marks]
ii. How would the surveyor detect the present of parallax in a level machine [2marks]
iii) Explain briefly how the surveyor eliminate parallax [5marks]
- b) Define the following terms: i) Plane surveying [3marks]
ii) Geodetic surveying [3marks]
- c) The following figures were extracted from a level field book page, some of the entries being illegible owing to exposure to rain, insert the missing figures, and show all the checks and balances of the results where necessary. [10marks]

BS	IS	FS	R(+)	F(-)	RL	REMARKS
2.150					1450.000	BM1
1.645		?	0.500		1450.500	
	2.345			?	1449.800	
?		1.965	?		1450.180	
2.050		1.825		0.400	1449.780	
	?		?		1451.500	
1.690		?	0.120		1451.620	
2.865		2.100		?	1451.210	
		?	?		1452.250	BM3

Question 4

a) Derive the formula for the curvature correction in levelling. Assuming the

refraction correction to be $\frac{1}{7}$ and the radius of the earth to be 6361.1km. modify the formula to give the combined correction for a sight distances. Hence calculate the distance in which the curvature is $5mm^2$ [5marks]

b) The following readings were taken with a dumpy level **0.894, 1.643, 2.896, 3.016, 0.954, 0.692, 0.582, 0.251, 1.532, 0.996, 2.135**. The instrument was shifted after fourth (4th) and eight reading. The first reading was taken on the staff held on the bench mark of RL 820.765 m. Rule out a page of a level field book and enter the above staff readings. [9 marks]

Calculate the reduced level of points and show the usual checks. [6 marks]

c) c. A surveyor's steel tape 30 m long has a cross-section of 15 mm × 0.75 mm. With this, line AB is measure as 150 m. If the force applied during measurement is 120 N more than the force applied at the time of calibration, what is the actual length of the line? Take modulus of elasticity for steel as $200KN/mm^2$. [5 marks]

Question 5

- a) Define the following levelling terms
- i) Level line [1mark]
 - ii) Horizontal line [1mark]
 - iii) Line of collimation [1mark]
- b) Describe the following level machines so as to distinguish them
- i) Tilting level [3marks]
 - ii) Dumpy level [3marks]
 - iii) Automatic level [3marks]
- c) Reduce the level book page shown below and obtain the final RLs after applying corrections for misclosure. [13marks]

B.S	I.S	F.S	RL	REMARKS
0.731			96.667	BMA
1.642		4.381		CP1
	3.080			A
	2.430			B
0.943		3.112		CP2
	4.070			C
	3.610			D
	3.420			E
	4.130			F
		3.481	89.015	BMB

Question 6

- a) Define the following;
- (i) Surveying [2 marks]
 - (ii) Engineering surveying [2 marks]
 - (iii) Construction surveying [1marks]
- b) Explain the importance of surveying in civil engineering [3 marks]
- c) Explain three various causes of error while carrying out survey works?

[3 marks]

- d) Explain the methods that can be used to minimize errors in Engineering survey works [4 marks]
- e) Outline the procedure of levelling up of a three foot screws level.[6 marks]
- f) Explain the two main classification of survey [4 marks]

“ End of Examination Paper”