



TECHNICAL UNIVERSITY OF MOMBASA  
**Faculty of Engineering &  
Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

**UNIVERSITY EXAMINATION FOR:  
BACHELOR OF SCIENCE IN CIVIL ENGINEERING  
(BSCEY2 S1)**

ECE 2202: ENGINEERING SURVEY I

**END OF SEMESTER EXAMINATION**

SERIES: APRIL 2014

**TIME ALLOWED: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- Answer booklet
- Scientific Calculator

This paper consists of **FIVE** questions.

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

All questions carry equal marks

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

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**Question One (COMPULSORY)**

- a) A steel tape of 30m length at a temperature of 20°C had a pull of 45.5N when lying flat. Its cross-sectional area was 7.5mm<sup>2</sup> and had a mass of 2.5kg and coefficient of linear expansion of 0.00012 per °C. The temperature during observation was recorded to be 26°C and the pull was 70N. Given other details such as: height difference between two sup  
E = 2.5 x 10<sup>11</sup>N/m<sup>2</sup>, R = 6370000m. The measurements were made at 2000m above sea level.  
Calculate the actual length of the measured distance. **(10 marks)**
- b) Define reciprocal levelling. With an aid of a sketch, describe its procedure. **(10 marks)**

- c) With an aid of a sketch, describe various parts of a tilting level. (10 marks)

### Question Two

- a) What is two peg test? Why is it important, describe/explain the procedures of carrying out this test. (10 marks)
- b) How do you overcome obstacles such as water body and a wide river encountered during linear surveying? (10 marks)

### Question Three

- a) With an aid of a sketch, show that combined curvature and refraction corrections area given by formula:

$$C R = 0.00785L^2 - \frac{1}{7}(0.0785L^2)$$

Where: C = Curvature correction  
 R = Refraction correction  
 L = is the measured length.

(10 marks)

- b) What factors should one consider when selecting vertical interval during contouring. (6 marks)
- c) Differentiate between vertical and horizontal intervals. (4 marks)

### Question Four

- a) The following figures were extracted from a level field book, some of the entries being illegible owing to exposure to rain. Insert the missing figures and check your results.

BS	IS	FS	HI	R.L	Remarks
?			279.08	277.65	O.B.M
	2.01			?	
	?			278.07	
3.37		0.40	?	278.68	
	2.98			?	
	1.41			280.64	
		?		281.38	T.B.M

- b) Explain the following terms as used in levelling:
- (i) Back sight (BS)
  - (ii) Fore sight (FS)
  - (iii) Change points (CP)
  - (iv) Height of instruments
  - (v) Intermediate sight (IS)
- (10 marks)

### Question Five

a) In levelling a cross a river, reciprocal levelling observations gave the following results for staff held vertically at X and Y from stations A and B on each bank respectively.

Staff reading of X from A = 1.753m

Staff reading of y from B = 2.080m

Staff reading of Y from A = 2.550m

Staff reading of Y from B = 2.895m

If the R.L of X was 100.37 AOD obtain that of Y

**(5 marks)**

b) Discuss errors in levelling, citing examples of these errors.

**(10 marks)**

c) What is vertical sectioning? Where is it applied?

**(5 marks)**