



**THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE**

**(A Constituent College of JKUAT)**

(A Centre of Excellence)

# **Faculty of Engineering & Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

**UNIVERSITY EXAMINATION FOR:  
BACHELOR OF SCIENCE IN CIVIL ENGINEERING**

ECE 2211: ENGINEERING SURVEYING II

**END OF SEMESTER EXAMINATION**

**SERIES: DECEMBER 2012**

**TIME: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions.

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

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) Define the following terms for a theodolite:

- (i) Vertical axis
- (ii) Horizontal axis
- (iii) Collimation axis
- (iv) Transiting

**(4 marks)**

b) Describe how temporary adjustment of a transit theodolite is carried out.

**(6 marks)**

c) Describe a process of measuring a horizontal angle using a theodolite.

**(5 marks)**

- d) The centring error in setting a theodolite over a survey station is 2mm. Compute the maximum and minimum error in measurement of clockwise angle ABC induced by the centring error if the magnitude of the angle is approximately 120° and the lengths of lines AB and BC are approximately 5m and 20m respectively. What conclusion can be drawn from this computation? **(5 marks)**

**Question Two**

- a) The mean observed internal angles of a closed traverse ABCDM (in anticlockwise order) shown in figure 1 are as follows:

Angle	Observed Value
DAB	97°41'
ABC	99° 53'
BCD	72° 23'
CDA	89° 59'

**Figure 1**

- (i) Adjust the angles  
 (ii) Compute the bearings of the adjusted angles. **(8 marks)**

- b) The following lengths, latitudes and departures were obtained for a closed traverse ABCDEFA

Long	Length (m)	Latitude	Departur e
AB	183.79	0	+183.79
BC	160.02	+128.72	+98.05
CD	226.77	+177.76	-140.85
DE	172.52	-76.66	-154.44
EF	177.09	-177.09	0.00
FA	53.95	-52.43	+13.08

Adjust the traverse by Bowditch method. (12 marks)

**Question Three**

- a) Explain the errors in tacheometric surveying. (6 marks)
- b) Explain the uses of tacheometric surveying (5 marks)
- c) Explain how you would obtain in the field the tacheometric constants. (4 marks)
- d) Up to what vertical angle may slope distance be taken as horizontal distances without the error exceeding 1 in 200, the staff being held vertically and the instrument having anallactic lens. (5 marks)

**Question Four**

- a) Explain the errors and how they can be eliminated in a theodolite survey.
  - (i) Due to imperfect adjustments of plate levels.
  - (ii) Due to non-parallelism of the axis of telescope level and line of collimation. (6 marks)
- b) Explain the transit method of traverse adjustment. (4 marks)
- c) The following traverse was run from station I – IV between which there occur certain obstacles.

Line	Length (m)	Bearing
I – II	351.3	N82° 28' E
II – III	149.3	N30° 41' E
III – IV	447.3	S81° – 43' E
IV – V	213.3	S86° 21' E

You are required to peg the midpoint of I-V. Calculate the length and bearing of a line from station III to the required point. (10 marks)

**Question Five**

- a) Explain **TWO** methods in which an open traverse can be checked. (5 marks)
- b) What is trigonometric leveling? (2 marks)
- c) (i) Explain “face left” and “face right” in theodolite operations.  
(ii) Given the following data determine angles ABC and ABD. (8 marks)

Point	Face Left	Face Right
A	00° 03' 50”	180° 04' 30”
B	17° 22' 10”	197° 23' 10”
C	83° 58' 60”	264° 00' 00”

<b>Point</b>	<b>Face Left</b>	<b>Face Right</b>
A	45° 12' 30"	225° 13' 30"
B	62° 31' 10"	242° 32' 10"
C	129° 07' 30"	309° 08' 40"

d) State all permanent adjustments of a common theodolite.

**(5 marks)**