



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

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING
(BSCE – Y2 S2)

ECE 2211: ENGINEERING SURVEY II

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 **FOUR** printed pages

Question One (COMPULSORY)

a) Given the following whole circle bearing (WCB) of three sides of a triangle as:

Side	WCB
AB	93° 24' 22"
BC	31° 12' 16"
CA	239° 58' 35"

Determine the internal angles of the triangle.

(5 marks)

b) The following co-ordinates of M and N were provided as follows:

Coordinates	Northings (m)	Eastings (m)
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N	959.29	209.42
N	502.39	129.63

Using BOWDITCH method, complete the table below:

Std	Bearing	Distance	Calculated		Adjustment		Adjusted		Final Coordinates
			ΔE	ΔN	δE	δN	ΔE	ΔN	
MB	356° 19' 06"	110.41							
BC	19° 55' 00"	120.41							
CD	24° 32' 30"	150.22							
DN	350° 22' 30"	98.16							

c) The following angles were adjusted for triangle ABC which were provided as:

$$\phi_A = 75^\circ 04' 25''$$

$$\phi_B = 42^\circ 35' 47''$$

$$\phi_C = 62^\circ 19' 48''$$

The datum co-ordinates of A and B were

N(m)	E(m)
A: +643649.19	+409577.46
B: +641 668.40	+412 600.36

Using the first principle, derive the coordinates of C from points A and B. **(10 marks)**

d) Discuss any TWO methods employed during a traverse adjustment **(5 marks)**

Question Two

a) Explain the TWO basic methods used in angle adjustments in a triangular scheme. **(4 marks)**

b) The field abstractions of figure 1 below shows the observed angles of a braced quadrilateral PQRS. Using the equal shift method, calculate the adjusted values of the angles.

Angle	Observed value
1	31° 20' 50"
2	53° 10' 45"
3	56° 44' 38"
4	38° 43' 39"
5	41° 53' 49"
6	42° 37' 47"
7	54° 54' 56"
8	40° 33' 30"

(16 marks)

Question Three

a) Define tacheometry.

(3 marks)

b) Using a sketch, derive expression for the horizontal distance, H, given β and α as angles of depression and differences in level L between points A and B.

(6 marks)

c) A tacheometer has a multiplying constant of 100 and an additional constant 1. When set up for use, the trunion axis had a reduced level of 15.2m and when sighted a vertically held leveling staff, the horizontal centre line read 1.8m and the lower and upper stadia lines 1.4m and 2.3m respectively. If the angle of elevation of the instrument was 9°, calculate:

(i) Horizontal distance (H) of the staff from the instrument.

(3 marks)

(ii) The reduced level of the ground at the staff position.

(3 marks)

d) Using a sketch, differentiate between face left observation (FL) and face right observation (FR) in a theodolite reading.

(5 marks)

Question Four

The field abstract for a triangulation scheme to establish a small construction site had the following observations.

Angle	Observed value
1	26° 10' 48"
2	27° 37' 16"
3	35° 46' 10"
4	32° 57' 52"
5	28° 23' 12"
6	29° 04' 37"
7	126° 15' 59"
8	111° 32' 32"
9	122° 32' 02"

Abstract for centre point triangle

Given the following stations F and B below adjust the angles:

N(m)	E(m)
F +250.00	+719.37
A +447.15	+250.00

(20 marks)

Question Five

- a) The coordinates of S, A and L were provided as NS = 1200.55m, E3 = 1310.22m, NA = 960m, EA = 1530.45m, NL = 580.82m, EL = 1240.22m respectively. Determine the coordinates of B by intersection method given the angles of S, A and L as $\angle BSA = 85^\circ 40' 55''$; $\angle SAB = 55^\circ 45' 54''$ and $\angle BAL = 41^\circ 42' 50''$ and $\angle ALB = 70^\circ 10' 03''$ **(6 marks)**
- b) An open traverse was run from A to E as shown below, determine its partial coordinates. **(14 marks)**

N