



TECHNICAL UNIVERSITY OF MOMBASA  
**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 2013

**TIME ALLOWED: 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 **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **FOUR** printed pages

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**Question One (Compulsory)**

- a) Derive an expression for horizontal distance (H) when  $\beta$  and  $\alpha$  are angles of elevation **(8 marks)**
- b) The following angles were adjusted for a triangle ABC. These were:

$$\alpha_A = 76^\circ 04' 35''$$

$$\alpha_B = 41^\circ 35' 47''$$

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

Give the datum coordinates as follows:

A +643 649.19                      +409 577.46

B +641 668.40 +412 600.36

Using first principle, derive the provisional co-ordinates of C **(8 marks)**

- c) A traverse was run from Donga to twiga to fix new points K6, K7, K8, K9, 10 and K11. Given the following data, compute the final corrected coordinates of this new points:

Donga +26 594.36 +68 6431.52

Twiga +28 162.86 +68 5828.56

The other details were:

Donga K6

251° 44' 00"

336.139

K6 – K7

354° 03' 22"

272.315

K7 – K8

43° 08' 09"

479.508m

K8 – K9

5° 20' 53"

366.565m

K9 – K10

326° 19' 50"

206.299m

K10 – K11

338° 06' 50"

334.422

K11 – Twiga

298° 32' 40"

430.924m

**(14marks)**

## Question Two

What are the two basic methods of angle adjustments in a triangular scheme? The figure below (figure 1) is of field abstraction. It indicates observed angles of a braced quadrilateral PQRS. Determine the adjusted values of the angles using equal shift method **(20 marks)**

Angle observed value

Figure 1

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

### Question Three

a) Explain the importance of the following parts of a theodolite:

- (i) Trivet stage
- (ii) Tri brach
- (iii) Optical phemmet
- (iv) Telescope clamp

**(8 marks)**

b) With an aid of a sketch, explain the difference between face left observations (F.L) and face right observations (F.R) of a theodolite

**(4 marks)**

c) The coordinates of stations S, A and P were provided as follows:

	E(M)	N(M)
S	+1309.12	+117050
A	+1525.43	+958.87
C	+1231.08	+566.81

Compute the coordinates of point B through intersection method from points S, A and P given that the following observations were made:

$$\hat{B} \hat{S} A = 85^{\circ} 38' 49'', \hat{S} \hat{A} B = 55^{\circ} 55' 53'' \text{ and } \hat{B} \hat{A} P = 68^{\circ} 09' 32''$$

**(8 marks)**

#### Question Four

A field abstract for a triangulation scheme (figure 2) below to establish a small construction site was to be made. Given the following data, adjust the angles. **(20 marks)**

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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°	11'	59"
8	111°	15'	52"
9	122°	32'	02"

#### Question Five

a) A tacheometer had a multiplying constant of 50 and an additional constant of one. When set up for use, the trunion axis had a reduce level of 18.00m. When sighted on a vertically held leveling staff, the horizontal centre line read 1.8m, and the lower and upper stadia lines had the readings 1.4 and 2.2m respectively. If the angle of the elevation was 8° determine:

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

**(3 marks)**

(ii) Reduced level of the ground at the staff position

**(3 marks)**

b) Discuss any TWO methods used in the adjustment of a traverse

**(8 marks)**