TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE 13S)

EBC 2105: ENGINEERING SURVEYING 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*

This paper consists of **FIVE** questions. Answer any **THREE** questions of the **FIVE** 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

a) (I) Define the term tacheometry.

(II) Differentiate between the following pair of terms:

(i) Changing faces and swinging
(ii) Line of collimation and vertical axis
(iii) Magnetic meridian and true meridian **(7 marks)**

b) The data shown in table 1 was observed during a tacheometric survey of three stations MNP. Given the reduced level of station N was 100 and that the staff was held vertically; and the instrument constants as 100 and zero, calculate:

(i) Distance MP; MN and NP
(ii) Area MNP in hectares
(iii) Differences in height MN and MP
(iv) Reduced level of points M and P **(13 marks)**

Table 1

Inst At	To	Vertical Angles	Staff Readings	HI	Horizontal Circle Readings
M	N	2° 40’	1.700, 2.400, 3.00	1.49	00° 00’ 00’
	P	-3° 00’	1.85, 2.37, 2.89		70° 50’ 00

Question Two

a) (i) Show that when two angles of elevation ϕ_1 and ϕ_2 are observed to a vertically held staff, that the horizontal distance (H) is given by:

$$H = \frac{S}{\tan\phi_1 - \tan\phi_2}$$

(ii) Derive an expression of the difference in height for the situation in Q2 a(i) above. **(8 marks)**

b) In order to determine the area of a triangular plot of land observations where taken on to points B and C from instrument station A and recorded as shown in table 2. Given the reduced level of the instrument station as 58.97m AMSL, calculate:

(i) Distances AB, AC and AC
(ii) Area ABC in hectares
(iii) The reduced levels of points B and C
(iv) The gradient of line BC **(12 marks)**

Table 2

Inst At	To	Vertical Angles	Staff Readings	HI	Whole circle bearings
A	B	2^o 52’ 4^o 10’	2.112 3.504	1.45	15^o 30’
	C	-1^o 47’ -2^o 55	1.783 2.995		82^o 10’

Question Three

a) Differentiate between the following pair of terms:
   (i) Closed traverse and open traverse
   (ii) Traverse leg and traverse station
   (iii) Link traverse and polygonal traverse **(6 marks)**

b) Figure 1 shows the clockwise angles of a traverse ABCDEFG. Given the whole circle bearing of line AB and FG as 33^o 41’ 24”, calculate the whole circle bearings of lines BC, CD, DE and FC.

Figure 1

(14 marks)

Question Four

Describe the following permanent adjustments of a theodolite:

a) Bubble error adjustment
b) Diaphragm error adjustment
c) Trunnion axis error adjustment **(20 marks)**

Question Five

a) State any ONE merit and TWO demerits of the tangential system as compared to the stadia systems of tacheometry. **(3 marks)**

b) Table 3 refers to a stadia tacheometric exercise with the staff held normally. The instrument constants were 100 and zero. Given the height of the instrument as 1.46m and the reduced level of point Q as 200.00m AMSL, calculate:

(i) Distances PQ, PR and QR
(ii) Area PQR
(iii) Differences in height PQ, PR and PR
(iv) The gradient of line PR **(17 marks)**

Table 3

Inst Stn	**To stn**	**Vertical Angles**	**Staff Readings**	**Height of Instrument**	**Horizontal Circle Readings**
		o ‘ “			o ‘ “
P	Q	2 00 00	2.150 2.650 3.150	1.46	25 00 00
	R	3 40 10	1.256 1.856 2.456		82 00 00