THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

CERTIFICATE IN CONSTRUCTION TECHNICIAN PART II

EBC 1106: THEODOLITE & TACHEOMETRIC SURVEY

END OF SEMESTER EXAMINATION

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer booklet*
- *Pocket calculator*
- *Pencil & Eraser*

This paper consists of **FIVE** questions
Answer question **ONE** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **FOUR** printed pages

SECTION A (COMPULSORY)

Question 1

a) State the uses of a theodolite   (3 marks)

b) Define the following terms as applied in theodolite work;

   (i)   Vertical axis
   (ii)   Collimation axis
   (iii)   Centering
   (iv)   Face left
   (v)   Transiting   (5 marks)

c) List **FOUR** permanent adjustment of a theodolite   (4 marks)

d) Describe the following horizontal angular measurement methods by use of a theodolite

   (i)   Repetition
   (ii)   Reiteration   (10 marks)

e) Table 1 shows data obtained during a tacheometric survey. If the multiplying and additive constants were 100 and 0 respectively:

   Determine the:-

   (i)   Horizontal distance between the instrument and the staff station

   (ii)   Difference in height between the two stations when the instrument is set 1.555m above the ground   (8 marks)

   Table 1

Vertical angle	Stadia reading (m)			Horizontal angle
	Top	Middle	Bottom	
-4º20' 30''	2063	1.532	1.000	41º 15' 45''

SECTION B (Answer *any TWO questions from this section*)

Question 2

a) State the functions of the following parts of a theodolite

   (i)   Centering devices
   (ii)   Optical plummet
   (iii)   Lower plate clamp   (3 marks)

b) Explain the leveling procedure of a theodolite (7 marks)

c) With the aid of a sketch, derive expressions for the horizontal distance and the difference in height for an inclined sight-to a vertical staff in stadia tacheometry (10 marks)

Question 3

Shown in table 2 are stadia tacheometric survey observations with the level held vertically. The instruments constants were 100 and 0. Given the reduced level of the instrument station as 887.000m, calculate:

(a) Distance AB, AC and BC
(b) The difference in height between AB and AC
(c) The reduced level of point B and C
(d) The difference in height between B and C
(e) Area ABC in hectares

Table 2

Instrument station	To statio	Horizontal angle	Vertical angle	Staff readings (m)	Height of instrument
A	B	06º 08' 00''	+5º 30'	1.250, 1.500, 1.750	1.60m
	C	56º 08' 00''	-1º 30'	2.450, 3.110, 3.775	1.60m

(20 marks)

Question 4

a) (i) Define the term tacheometry

(iii) Differentiate between stadia and tangential systems of tacheometry. (3 marks)

b) Table 3 shows horizontal circle readings about a point. Reduce the angles using angular booking table and illustrate the configuration of the stations on a sketch. (7 marks)

Table 3

Instrument at	To point	Face left			Face right		
		º	'	' '	º	'	' '
Y	P	12	16	00	192	16	20
	Q	43	39	20	223	40	20
	R	141	06	20	321	07	40
	S	207	53	40	27	54	20
	P	12	16	20	192	17	20

c) Describe the collimation error adjustment of a theodolite (10 marks)

Question 5

a) Describe the procedure to determine tacheometric constants of a theodolite   (10 marks)

b) (i) Describe the substense tacheometry   (5 marks)

(iii)   The readings shown in Table 4 were taken in the measurement of vertical angle.

Calculate the angles

Instrument Station	To station	Face left			Face right		
		°	'	' '	°	'	' '
	C	91	40	20	268	39	59
	T	02	29	35	177	31	40

(5 marks)