



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)

University Examinations for 2014/2015

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FIRST SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

BCECD 205: ENGINEERING SURVEYING II

Date: 02/04/2015

Time: 08:30 – 10:30 am

Instructions:

- This paper comprises of **five** questions
- Question **one** is **compulsory** and carry 30 marks
- Answer any **other two** questions

1 a) Distinguish between the following co-ordinate systems

- i. Polar and Rectangular co-ordinates
- ii. Reduced and Whole Circle bearings (4 marks)

b) State six considerations in the selection of compass traverse stations (6 marks)

c) With an aid of a well labeled sketch outline the function of five parts of a theodolite (10 marks)

d) Explain the Vertical Circle Index Adjustment under the following sub-headings;

- i. Aim
- ii. Test
- iii. Adjustment (10 marks)

2 a) Explain the following terms as applied in theodolite surveying;

- i. Face left observations
- ii. Centering
- iii. Transiting

- iv. Swinging the telescope
 - v. Lining in
 - vi. Balancing in (9 marks)
- b) A tacheometer with a multiplying constant of 100 and an additive constant of 0 was set up at station A of reduced level 1550.0 m. If the height of instrument was 1.55 m, determine the reduced levels of points B and C given the following information:

	Observations to staff held vertically at	
	B	C
Vertical circle	89°45' 00"	90°18' 00"
Upper staff reading	2.060	3.060
Middle staff reading	1.530	2.530
Lower staff reading	1.000	2.000

(11 marks)

- 3 a) State five geometrical relationships of a correctly adjusted theodolite (5 marks)

b) The table below shows data obtained during a compass traverse exercise.

Line	Forward bearing	Back bearing
AB	89°40' 00"	271°25' 00"
BC	122°40' 00"	301° 40' 00"
CD	240°10' 00"	60°10' 00"
DA	323°10' 00 "	142°25' 00"

- i. Identify the stations that are free from local attraction
- ii. Determine the correct bearings for the traverse lines
- iii. If the magnetic declination on site was found to be 3° 45' west, determine the true bearings of the traverse lines (15 marks)

- 4 a) Convert the following quadrantal bearings to whole circle bearings

- i. N45° 30'E
- ii. S54° 15'E
- iii. N89° 30'W
- iv. S28° 15'W (4 marks)

b) State three sources of errors in horizontal distances determined tacheometrically giving relevant examples in each case (6 marks)

c) With the aid of a sketch derive the tacheometric formulae for determining horizontal distance and the difference in height between two points when the staff is held vertical and the line of sight inclined upwards. (10 marks)

5 a) The table below shows data obtained on a road survey exercise. Determine the correct vertical angles to points M, N and P

Point	Height of target	Vertical angle	
		Face Right	Face Left
M	1.250 m	88°12' 20"	271°45' 27"
N	1.250 m	89°28' 30"	270°29' 30"
P	1.250 m	90°38' 10"	269°19' 42"

(5 marks)

b) The table below shows tacheometric bookings to observations on an inclined staff at stations K and L. The co-ordinates of the instrument station are; (+ 1440.00 mN, - 875.00 mE). If the tacheometric constants are 100 and 0, determine;

The co-ordinates of K and L

Difference in height between K and L

Staff station	Bearing	Vertical angle	Stadia readings (m)		
K	303°44' 20"	+ 12°12'	1.08	1.63	2.52
L	190°58' 40"	- 8° 24'	2.00	2.67	3.49

(15 marks)