



# MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)  
University Examinations for 2015/2016

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:

Time:

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## INSTRUCTIONS:

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

1. a) List three types of theodolites (3 marks)
- b) Define the following terms as referred to in theodolite measurements
  - i. Face-left
  - ii. Transiting
  - iii. Balancing in
  - iv. Lining in (6 marks)
- c) Briefly describe three methods of measuring horizontal angles in theodolite traversing (9 marks)
- d) With an aid of a neat labeled sketch describe the following parts of the theodolite
  - i. The eye-piece
  - ii. The objective
  - iii. The vertical circle

- iv. The upper and lower plate levels
  - v. Plate bubble tube
  - vi. Vertical clamping screw (12 marks)
2. a) Describe how you would centre a theodolite over a station mark (4 marks)
- b) State six considerations in the selection of compass traverse stations (6 marks)
- c) Explain the order of executing temporary adjustments in theodolite traversing (10 marks)
3. a) Convert the following quadrantal bearings to whole circle bearings
- i.  $N25^{\circ} 20' E$
  - ii.  $S60^{\circ} 24' E$
  - iii.  $N89^{\circ} 10' W$
  - iv.  $S31^{\circ} 55' W$  (4 marks)
- b) State three sources of errors in theodolite surveying giving relevant examples in each case (6 marks)
- c) With the aid of a sketch derive the tacheometric formulae for determining horizontal distance and elevation between two points when the staff is held vertical and the line of sight inclined upwards. (10 marks)
4. 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   | $89^{\circ}40' 00''$  | $271^{\circ}25' 00''$  |
| BC   | $122^{\circ}40' 00''$ | $301^{\circ} 40' 00''$ |
| CD   | $240^{\circ}10' 00''$ | $60^{\circ}10' 00''$   |
| DA   | $323^{\circ}10' 00''$ | $142^{\circ}25' 00''$  |
- 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  $3^{\circ} 45'$  west, determine the true bearings of the traverse lines (15 marks)
5. a) State three systems of tacheometric surveying (3 marks)

- b) The table below shows tachometric observations on an inclined staff at stations P and T. The co-ordinates of the instrument station are; (+ 1540.00 mN, - 1075.00 mE). If the tachometric constants are 100 and 0, determine;

- i. The co-ordinates of P and T
- ii. Difference in height between P and T

| Staff station | Bearing     | Vertical angle | Stadia readings (m) |      |      |
|---------------|-------------|----------------|---------------------|------|------|
| P             | 300°30' 40" | + 14°10' 00"   | 1.28                | 1.83 | 2.50 |
| T             | 180°40' 20" | - 8° 40' 00"   | 2.20                | 2.60 | 3.46 |

(17 marks)