



MACHAKOS UNIVERSITY
University Examinations for 2021/2022 Academic Year
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING
SECOND YEAR SECOND SEMESTER EXAMINATION FOR
BACHELOR OF SCIENCE (CIVIL ENGINEERING)
ECV 206: SURVEYING II

DATE: 3/6/2022

TIME: 8.30-10.30 AM

INSTRUCTIONS:

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

QUESTION ONE (30 MARKS)

- a) Define the following terms as used in surveying
- i. Trigonometric leveling
 - ii. Plane table
 - iii. Trilateration (6 marks)
- b) Describe two methods of adjusting a theodolite. (4 marks)
- c) Describe the basic principle of optical distance measurements in surveying. (4 marks)
- d) The constants f/i and $(f+d)$ of a certain tacheometer were 100 and 0.3 respectively. The readings of the three diaphragm-hairs on a staff held at a distant object were found to be 1.16, 2.40, 3.44, the telescope being horizontal. Find the horizontal distance of the staff from the instrument axis and the R.L. of the staff point, if the R.L. of instrument axis is 80.00m. (6 marks)
- e) In a theodolite traversing the bearing of PQ and QR are $18^\circ 36'$ and $60^\circ 24'$ respectively. The co-ordinates of the ends P and R are:

Point	North Co-ordinate	East Co-ordinate
P	300.0	400.0
R	1432.8	1257.2

Find the lengths of PQ and QR. (10 marks)

QUESTION TWO (20 MARKS)

- a) Outline methods used in measuring horizontal angles in theodolite surveying. (6 marks)
- b) Discuss **Three** main errors in stadia surveying. (6 marks)
- c) The co-ordinates of two points A and B are as follows:

Point	Coordinates	
	Northing	Easting
A	500.25	640.75
B	840.78	315.60

Find the length and bearing of AB. (8 marks)

QUESTION THREE (20 MARKS)

- a) Differentiate between Transit and Non transit Theodolite. (4 marks)
- b) Describe the main steps in setting up of a theodolite. (6 marks)
- c) The following are the lengths and bearings of the sides of a traverse ABCD.

Line	Length in metres	Bearing
AB	235.00	343° 54′
BC	317.50	87° 52′
CD	215.00	172° 42′
DA	281.50	265° 14′

The bearing are referred to the magnetic meridian, the value of magnetic declination being 5° 32′ west. Convert the observed bearings to the true bearing and find the closing error.

(10 marks)

QUESTION FOUR (20 MARKS)

- a) Describe **Five** essential characteristics of a tacheometer. (5 marks)
- b) Describe the major steps of conducting tacheometric survey. (5 marks)
- c) The following notes refer to a line which has been leveled tacheometrically with a tacheometer fitted with an anallatic lens, the multiplying constant being 100.

Instr. Stn.	Height of axis	Staff station	Vertical Angle	Hair Reading	Remarks
P	1.50	B.M	$-6^{\circ} 12'$	0.963, 1.515, 2.067	R.L of B.M = 360.000 Staff being held vertically
P	1.50	Q	$+7^{\circ} 5'$	0.819, 1.541, 1.863	
Q	1.60	R	$12^{\circ} 27'$	1.860, 2.445, 3.030	

Compute the R.Ls. of P, Q and R, and the horizontal distances PQ and QR. (10 marks)

QUESTION FIVE (20 MARKS)

- With aid of sketch describe the general principle of Stadia Tacheometry. (5 marks)
- To determine the constant of a tacheometer, two distances 201 m and 400 m were accurately measured from the instrument and readings on a Stadia rod on the upper and lower wires were taken as follows:

Distance in meters	Readings at;	
	Lower Stadia	Upper Stadia
201	2.00	400
400	0.50	450

Determine the values of the constants and find the distance when the readings of the stadia wires were 1.5 m and 4.5 m. The line of sight being horizontal in all cases. (7 marks)

- The consecutive coordinates of a line AB are -647.3 and + 457.2 with reference to the magnetic meridian. Calculate its coordinates with reference to the true meridian, given that the magnetic declination is $10^{\circ} 8'$ east. (8 marks)