MACHAKOS UNIVERSITY

BUILDING & CIVIL ENGINEERING DEPARTMENT

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

THIRD YEAR EXAMINATION FOR BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV 206: SURVEYING II

DATE: DECEMBER 2020 **TIME: 2 HOURS**

INSTRUCTIONS

- *This paper comprises of five questions. Answer **three** questions*
- *Question one is **compulsory** and carry's 30 marks*
- *Use well labeled and neat diagrams where applicable.*
- *Answer any other **two** questions*

Question 1 (30 Marks)

a. Briefly discuss the three type's theodolites (6 Marks)
b. Define the following terms with regards to theodolite use (6 marks)
    a) Line of collimation
    b) Face left condition
    c) Plunging the telescope
    d) Double centering
c. State at least four simple targets often used in control surveys and setting out (4 Marks)
d. What are some of the mistakes that may be encountered in theodolite angle measurements due to carelessness of the observer (5 Marks)
e. Angle of elevation measured for a tower erected over a building from a point of an instrument located on the ground was 12° and 9° for the top and bottom of the tower respectively. The height of the tower is 9 m. If the angle at depression of plinth level of the building from the same instrument is 4°, calculate the height of the building. (7 Marks)

f. A Civil engineering student from Machakos University noticed that the theodolite she was using had a parallax error, explain briefly how she can eliminate the parallax before measuring angles. (2 Marks)

Question 2 (20 Marks)

An EDM slope distance AB is determined to be 561.276 m. The EDM instrument is 1.820 m above station A, and the prism is 1.986 m above station B. The EDM instrument is mounted on a theodolite whose optical center is 1.720 m above the station. The theodolite was used to measure the vertical angle (+6°21'38'') to a target on the prism pole; the target is 1.810 m above station B. With help of a diagram compute both the horizontal distance AB and the elevation of Station B, if the elevation of station A=186.275

Question 3 (20 Marks)

a. With the help of a sketch show that in polar computation given two-dimensional coordinates (N_1,E_1) of a point P_1,and the distance L and bearing α of another point P_2 from P_1,that the coordinates (N_2,E_2) of P_2 are given by; (6 Marks)

$$N_2 = N_1 + L \cos \alpha \text{ and } E_2 = E_1 + L \sin \alpha$$

b. Hence compute the Northing and Easting of point P_2 given the coordinates of the point P_1 are N_1=+907350.85 and E_1= +183416.94 and α=112°31'00'' (4 Marks)

c. Also using your sketch in a above show that for joint computation given coordinates (N_1,E_1) of a point P_1 and coordinates (N_2,E_2) of P_2 the distance and bearing of P_2 from P_1 is given by. (4 Marks)

$$\text{Tan} = \Delta E/\Delta N \text{ and } L = \Delta N/\cos \alpha = \Delta E/\sin \alpha$$

d. And hence compute the bearing and distance of a point P_2 from P_1 given that their Northings and Eastings are as follows (6 Marks)

Point	Northings	Eastings
P_1	+26759.89	+686084.12
P_2	+27103.97	+686406.51

Question 4 (20 Marks)

With the help of a sketch determine the gradient from a point A to B from the following observations made with a fixed hair tachometer fitted with an anallactic lense the constant of the instrument being 100.

Reading	Bearing	Reading on stadia hair (m)		Reading on axial hair (m)	Vertical angle
To A	345°	0.75	2.12	1.435	+15°
To B	75°	0.625	3.05	1.835	-10°

Question 5 (20 Marks)

A civil engineer wanted to determine the elevation of top Q of a signal on a hill observations were made from two points P and R. All the three points are in the same vertical plane. The distance between P and R is 120m height of the signal is 4 m. With the help of a sketch find out R.l of the foot of the signal.

Angle of Elevation to Q	**From P=25°35'**
	From R=15°5'
Staff Reading at BM	**From P=2.755 m**
	From R=3.855 m
R.L of BM =105.42 m	