



MACHAKOS UNIVERSITY

University Examination 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

THIRD YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE (CIVIL ENGINEERING)

ECV 304 SURVEYING III

DATE: 24/3/2021

TIME: 2.00-4.00 PM

INSTRUCTIONS: Answer questions **ONE** and any other **TWO** questions

QUESTION ONE (30 MARKS)

- a) Outline the principle behind the rate of approach stating its application in route location (4 marks)
- b) The Volumes in cubic meters of excavation (+) and fill (–) between successive sections 100 m apart on a 1300-m length of a proposed railway are given.

Section	0	1	2	3	4	5	6	7
Volume (m ³)	–1000	–2200	–1600	–500	+200	+1300	+2100	
Section	7	8	9	10	11	12	13	
Volume (m ³)	+1800	+1100	+300	–400	–1200	–1900		

- i. Draw a mass haul diagram for this length.
- ii. If earth may be borrowed at either end, which alternative would give the least haul? (6 marks)
- c) With the aid of a clearly labelled diagram, derive the formula for the Apex distance in curves. (4 marks)
- d) Two straights, with a deflection angle of 36° , are to be joined with a circular curve of 500m radius. The forward chainage of the Intersection Point is 6051.35m. Compute the setting-out data required for chords of 20m length. (16 marks)

QUESTION TWO (20 MARKS)

- a) Define the following terms as used in computation of earthworks (8 marks)
- Haul
 - Waste
 - Borrow
 - Limit of economical haul
- b) Outline the methods used in the establishment of the survey controls (4 marks)
- c) Describe the principle of operation of a planimeter (8 marks)

QUESTION THREE (20 MARKS)

- a) Describe how a control point could be obtained using the intersection method (6 marks)
- b) Outline the sources of error in traversing (3 marks)
- c) The coordinates of A, B and C in the figure below are:

E_A 1234.96m N_A 17 594.48m

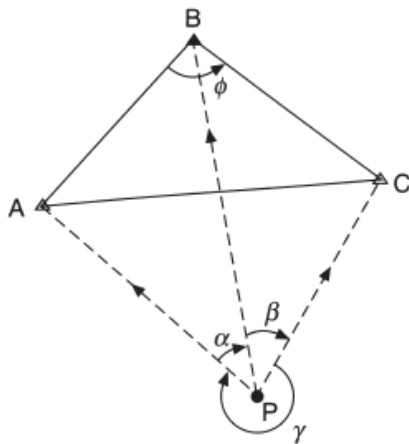
E_B 7994.42m N_B 24 343.45m

E_C 17 913.83m N_C 21 364.73m

And the observed angles are:

$APB = \alpha = 61^\circ 41' 46.6''$

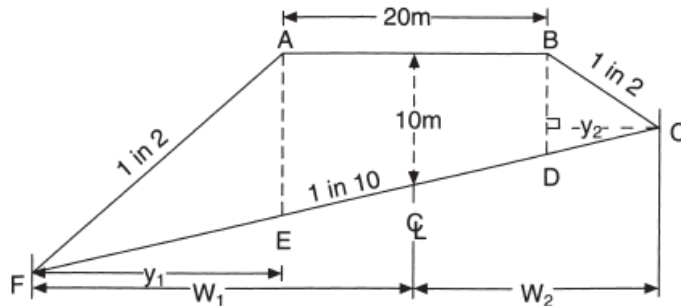
$BPC = \beta = 74^\circ 14' 58.1''$



- d) Find the coordinates of P. (11 marks)

QUESTION FOUR (20 MARKS)

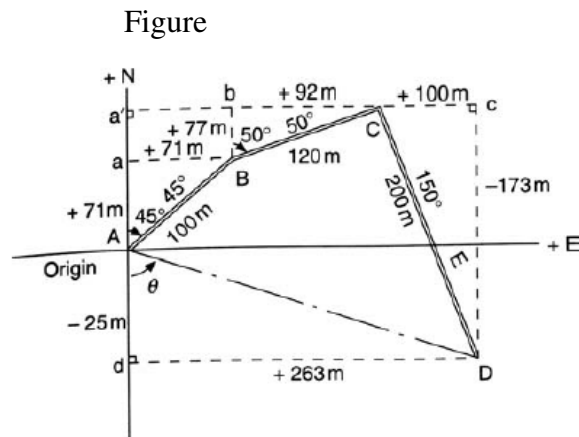
- a) In the figure below, the line AB defines the road formation level to be attained and the line FC defines the existing ground level.



- Compute the area of the fill and the side widths W_1 and W_2 (6 marks)
- b) Outline two major needs of providing curves (2 marks)
- c) Describe the properties of a mass haul diagram (12 marks)

QUESTION FIVE (20 MARKS)

- a) Compute the area of the polygon ABCD by coordinates. Then carry out a check of the area by using the geometric shapes (6 marks)



Coordinates

Stns	E	N
A	0.0	0.0
B	71	71
C	163	148
D	263	-25
A	0.0	0.0

- b) Derive Simpson's Rule method of area estimation (7 marks)
- c) Outline the procedure of running a traverse (7 marks)