



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING
SECOND YEAR FIRST SEMESTER EXAMINATION FOR
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV 206: SURVEYING II

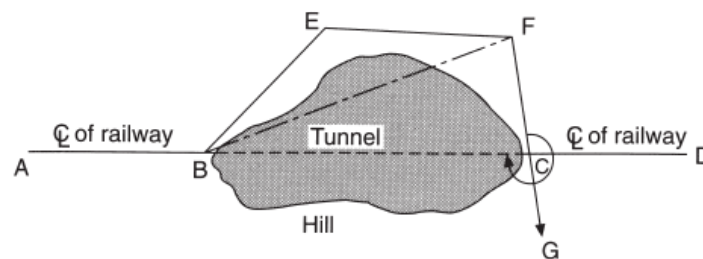
DATE: 21/5/2019

TIME: 8:30 – 10:30 AM

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

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) A level railway is to be constructed from *A* to *D* in a straight line, passing through a large hill situated between *A* and *D*. In order to speed the work, the tunnel is to be driven from both sides of the hill (see the figure below).



The centre-line has been established from *A* to the foot of the hill at *B* where the tunnel will commence, and it is now required to establish the centre-line on the other side of the hill at *C*, from which the tunnel will be driven back towards *B*. To provide this data the following traverse was carried out around the hill:

<i>Side</i>	<i>Bearing</i>			<i>Horizontal distance (m)</i>	<i>Remarks</i>
	°	'	"		
<i>AB</i>	88	00	00	—	Centre line of railway
<i>BE</i>	46	30	00	495.8 m	
<i>EF</i>	90	00	00	350.0 m	
<i>FG</i>	174	12	00	—	Long sight past hill

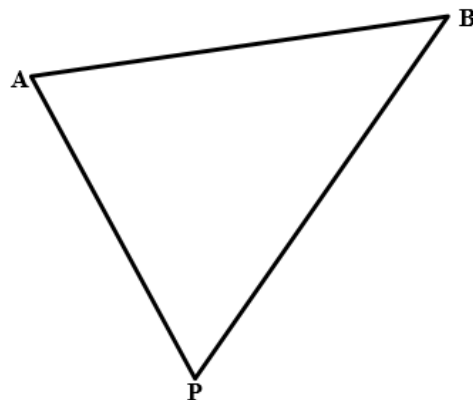
Calculate: (6 marks)

- The horizontal distance from F along FG to establish point C.
 - The clockwise angle turned off from CF to give the line of the reverse tunnel drivage.
 - The horizontal length of tunnel to be driven.
- b) In a traverse ABCDEFG, the line BA is taken as the reference meridian. The coordinates of the sides AB, BC, CD, DE and EF are:

<i>Line</i>	<i>AB</i>	<i>BC</i>	<i>CD</i>	<i>DE</i>	<i>EF</i>
ΔN	-1190.0	-565.3	590.5	606.9	1017.2
ΔE	0	736.4	796.8	-468.0	370.4

If the bearing of FG is $284^\circ 13'$ and its length is 896.0 m, find the length and bearing of GA. (2 marks)

- Describe the three types of traverses used to establish survey controls (3 marks)
- In the figure below, A and B have coordinates 1870.74mE, 953.56mN and 2013.53mE, 1020.23mN respectively. Determine the coordinates of P if, distance AP and BP have been measured by EDM as 143.94m and 178.08m respectively. (6 marks)



- e) With the aid of well labelled diagrams, describe the principle behind the stadia method in tachometry (9 marks)
- f) Describe the basic principle of satellite position fixing. (4 marks)

QUESTION TWO (20 MARKS)

- a) Outline the methods used in the establishment of the survey controls (4 marks)
- b) Outline the computation steps in a traverse (8 marks)
- c) Explain how the coordinates of a point can be determined by observations to known points. (8 marks)

QUESTION THREE (20 MARKS)

- a) Describe how a control point could be obtained using the intersection method (7 marks)
- b) Explain the basic features of a typical theodolite (13 marks)

QUESTION FOUR (20 MARKS)

- a) Describe the steps involved in setting up a theodolite (7 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

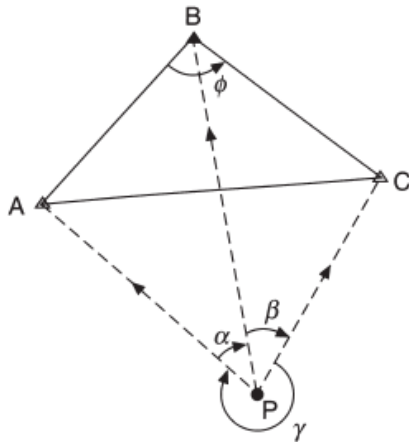
E_B 7994.42m N_B 24 343.45m

E_C 17 913.83m N_C 21 364.73m

And the observed angles are:

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

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



Find the coordinates of P.

(10 marks)

QUESTION FIVE (20 MARKS)

A link traverse below commences from known stations, A and B, and connects to known stations C and D. The bearing of the link AB is $151^{\circ}27'38''$ and that of CD is $347^{\circ}37'41''$. The observed angles and distances are as in the table below.

Station	Observed angle	Line	Distance (m)
B	$143^{\circ}54'47''$	B- E_1	651.16
E_1	$149^{\circ}08'11''$	E_1 - E_2	870.92
E_2	$224^{\circ}07'32''$	E_2 - E_3	522.08
E_3	$157^{\circ}21'53''$	E_3 - E_4	1107.36
E_4	$167^{\circ}05'15''$	E_4 - C	794.35
C	$74^{\circ}32'48''$		

Given that the coordinates of point B & C are (3854.28, 9372.98) & (7575.56, 8503.21) respectively, compute the adjusted coordinates of points E_1 , E_2 , E_3 , E_4 .