**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**
**FACULTY OF ARCHITECTURE AND QUANTITY SURVEYING**
**BACHELOR OF QUANTITY SURVEYING (HONOURS) DEGREE**
**PART II SECOND SEMESTER EXAMINATIONS – MAY 2005**

**ENGINEERING SURVEYING II – AQS 2204**

**TIME:** 3 Hours **TOTAL MARKS:** 100

**INSTRUCTIONS:**

Answer any four Questions.

## QUESTION 1

Calculate the coordinates of point F in the triangulation net-work shown in fig. 1, given the following information:

Information

Horizontal angles

ABC = $48^0\,51^0\,40''$
BAC = $62^0\,13'\,00''$
DCE = $35^0\,42'\,20''$
CDE = $91^0\,01'\,50''$
FEA = $45^0\,03'\,30''$
FAE = $61^0\,39'\,10''$

Coordinates (m)

| | |
|---|---|
| A + 600,584 | +615,620 |
| B + 744,236 | +502,487 |
| D + 769,266 | +814,307 |

(25 marks)

## QUESTION 2

Two curve centres P and Q (see fig. 2) have to be joined by a straight length of crack $T_1$ $T_2$ tangential to both curves.

Given

| Coordinates | | Radius of curve (m) |
|---|---|---|
| P +347,910 | -279,370 | 600 |
| Q + 441,330 | -352,010 | 400 |

Calculate
(i) the coordinates of $T_1$ and $T_2$
(ii) the distance $T_1$ and $T_2$ and bearing $T_1$ - $T_2$

(25 marks)

**QUESTION 3**

A straight tunnel is to be driven at a constant slope on the line joining two stations, A and D which are on opposite sides of a hill (see fig. 3). An initial survey is required to establish the positions of the proposed tunnel entrances and to enable this to be done, three additional points B, C and E are established on the hill. A closed-loop traverse A B C D E A is run and the following observations were obtained.

Observations
Bearing A-B = $327^0\,18'\,18''$
Coordinates of P +500,000 +500,000

| Clockwise angle | Observed Value | Horizontal Distances (m) |
|---|---|---|
| ABC | $93^0\,17'\,45''$ | AB = 119,450 |
| BCD | $82^0\,43'\,19''$ | BC = 588,310 |
| CDE | $141^0\,18'\,47''$ | CD = 123,280 |
| DEA | $93^0\,18'\,44''$ | DE = 391,110 |
| EAB | $129^0\,21'\,35''$ | EA = 405,580 |

Calculate the adjusted coordinates of the closed-loops traverse (adjusted by Bowditch method). (25 marks)

**QUESTION 4**

Point C was surveyed by resection. (see fig. 4). The following information was obtained:

Observed horizontal angles

PCB = $142^0\ 01'\,55''$
BCA = $139^0\,00'\,55''$
PCA = $78^0\,56'\ 55''$

Given
Coordinates (m)
P + 9392,800 + 18952,020
A + 9844,180 + 16375,000
B + 13365,170 + 18536,060
Calculate the provisional coordinates of point C. (25 marks)

**QUESTION 5**

Survey stations M, N and O form a right-angled triangle at station M. (See fig. 5). A theodolite whose constants are s = 100 (multiplying constant) and k = 0 (additive constant) was used to determine the following tachometric data.

Instrument Station M, Height of instrument = 1,410m

| TARGET STATION | VERTICAL ANGLE | STADIA READING | | |
|---|---|---|---|---|
| | | UPPER | MID | LOWER |
| N | $95^0\,40'$ | 1,830 | 1,500 | 1,170 |
| O | $82^0\,30'$ | 2,810 | 2,610 | 2,410 |

Calculate

a) horizontal lengths MN, MO and NO (9 marks)

b) reduced levels of N and O given that the reduced level of M = 1129,600m (10 marks)

c) If points M, N and O were lying in a plane, calculate the area of the triangle MNO. (6 marks)

**QUESTION 6**

The center point triangle shown in fig. 6 is to be used as a control network on a construction site. Adjust the measured horizontal angles given below for geometrical consistency using any method you learnt.

| Angle | Observed Value |
|---|---|
| 1 | $26^0\,10'\,48''$ |
| 2 | $29^0\,04'\,37''$ |
| 3 | $28^0\,23'\,12''$ |
| 4 | $32^0\,57'\,52''$ |
| 5 | $35^0\,46'\,10''$ |
| 6 | $27^0\,37'\,16''$ |
| 7 | $126^0\,11'\,59''$ |
| 8 | $122^0\,32'\,02''$ |
| 9 | $111^0\,15'\,52''$ |

**END OF EXAMINATION**