

**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY  
DEPARTMENT OF CIVIL AND WATER ENGINEERING  
FACULTY OF INDUSTRIAL TECHNOLOGY  
BACHELOR OF ENGINEERING (HONOURS) DEGREE  
PART II SUPPLEMENTARY EXAM.-SEPT. 2008  
ENGINEERING SURVEY II TCW 2204**

**INSTRUCTIONS**

Answer any four questions

Time : 3 hours  
Total Marks : 100

**QUESTION 1**

Describe the Zimbabwean survey coordinate system.(25 marks)

**QUESTION 2**

Fig. 2 shows a link traverse that was run from points Z and Y. Given the following information ;

Coordinates (m)

Z	+ 9 328,110	+ 2 164,470
Y	+ 5 526,770	+ 5 449,490

Observed horizontal angles

Horizontal distances (m)

Y = $97^{\circ} 35' 28''$	YX = 1950,350
X = $76^{\circ} 18' 00''$	XR = 1473,800
R = $167^{\circ} 09' 46''$	RS = 19,920
S = $125^{\circ} 31' 25''$	ST = 738,400
T = $273^{\circ} 02' 58''$	TU = 2508,090

Calculate the coordinates of points X , R , S , T and U (25 marks)

**QUESTION 3**

Point S was surveyed by sighting three trigonometrical beacons as shown in fig.3.

Given the following information:

Angle	Observed value
TSD	$138^{\circ} 00' 30''$
DSE	$78^{\circ} 55' 30''$
TSE	$143^{\circ} 06' 00''$

Coordinates (m)

D + 540,000	+ 180,000
E + 480,000	- 144,000
T + 25,800	+ 9,490

Calculate the provisional coordinates of point S. (25 marks)

#### **QUESTION 4**

Fig 4 shows a triangulation network. The following observed angles were obtained:

<u>Angle</u>	<u>Observed Value</u>
1	$50^{\circ} 21' 19''$
2	$56^{\circ} 21' 41''$
3	$43^{\circ} 19' 39''$
4	$29^{\circ} 57' 24''$
5	$47^{\circ} 21' 36''$
6	$59^{\circ} 21' 36''$
7	$34^{\circ} 52' 11''$
8	$38^{\circ} 24' 45''$

Adjust the observed angles for geometrical consistency . (25 marks)

#### **QUESTION 5**

ST and PR are two tracks to be joined by a curve of radius 860m.

GIVEN

Bearing S-T =  $180^{\circ} 00' 00''$

Coordinates(m)

T + 1 03255,400      - 3 255,600

P + 1 0855,500      - 4 295,800

Calculate the coordinates of R. (25 marks)

**List of formulae**

$$|V''| = \frac{a-c}{(ab+cd) \sin 1''}$$

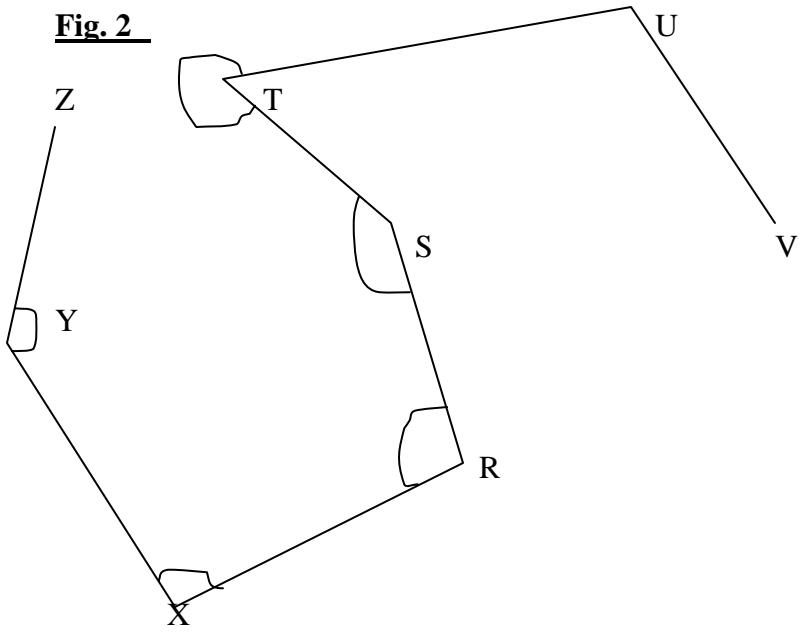
$$a = \sin 1 \times \sin 3 \times \sin 5 \times \sin 7$$

$$b = \cot 1 + \cot 3 + \cot 5 + \cot 7$$

$$c = \sin 2 \times \sin 4 \times \sin 6 + \sin 8$$

$$d = \cot 2 + \cot 4 + \cot 6 + \cot 8$$

**Fig. 2**



S

**Fig. 3**

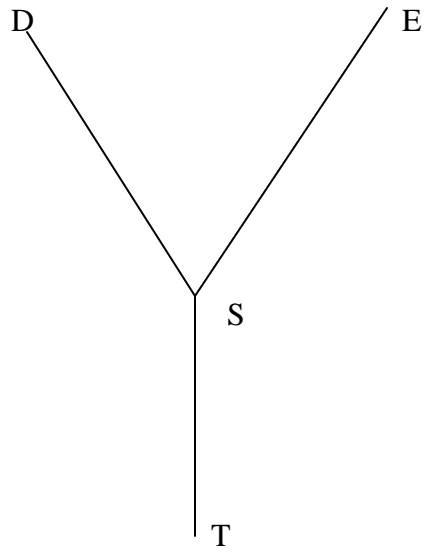
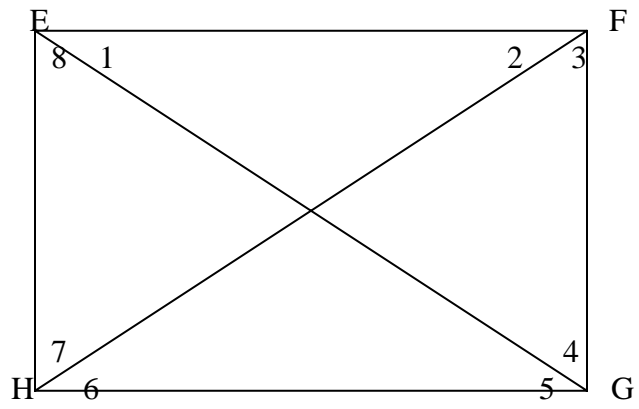


Fig.4



**Fig. 5**

