University Of Technology
Building and Construction Eng. Dept.
Final Exam – First Attempt – 2010/2011

Subject : Engineering surveying
Branch : All Branches

Class: 2nd Class
Time : 3 Hours
Date : 14/6/ 2011

NOTE: Answer Four Questions only

Q1) **(25Marks)**

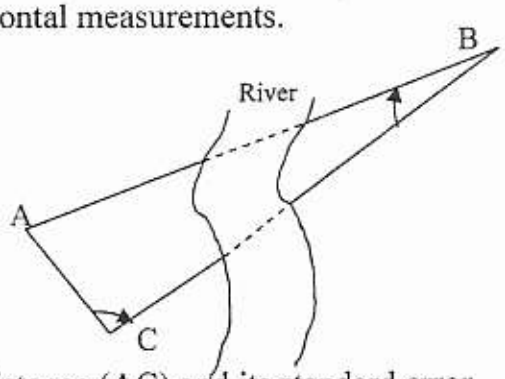
For the purpose of measuring the horizontal distance [AB] shown in the figure below, a (30 m) steel tape were used to take the following horizontal measurements.

D_{AC} = 52.035 m, 52.120 m, 52.085 m, 51.960 m

Angle C= 115° ± 1'

Angle B= 32° ± 00"

If the actual length of the tape= 30.020 m.



a. Compute the most probable value of the horizontal distance (AC) and its standard error.

b. Compute the horizontal distance (AB) and its standard error.

Q2) **(25 Marks)**

A. For the purpose of establishing new bench mark (A), the deference in height between point (A) and points (BM1, BM2, BM3) has been measured and the results are as follows:

Route	From	To	ΔZ m	Number of Level Setups	Elevation m
R1	BM1	A	5.492	17	BM1 =42.093
R2	BM2	A	7.440	9	BM2 =40.143
R3	BM3	A	23.480	10	BM3 =24.102

Compute the most probable value of the elevation of point (A) and its standard error.

B. The table below represents the field data of profile leveling using the level along the center line of a road. Compute the amount of cut or fill in all road center line stations.

Station	B.S m	F.S m	I.F.S m	Ground Elevation m	Grade Elevation m
BM1	1.789			33.889	
0+00			2.477		34.00
1+00			2.654		
1+25			1.634		
2+00			1.325		
2+50			1.444		33.00
BM2		0.798		34.880	

Q3)

A. The table below represents the field measurements of a traverse using theodolite and tape:

Theodolite station	Observed station	Telescope D or R	H.C.R	Horizontal Distance (m)
B	K	D	$0^0 00' 00''$	
	C	D	$95^0 09' 30''$	450
C	B	D	$30^0 00' 00''$	
	E	D	$180^0 56' 17''$	800

Knowing that; X_B=2080.000 m , Y_B=5409.615m ,

Azimuth of the line $\overrightarrow{KB}$ =AZ_{KB}=30°.

1. Compute the horizontal angles to the right and the deflection angles (KBC, BCE) **(4 Marks)**
2. Compute the horizontal (X, Y) coordinates of points [C, E]. **(11 Marks)**

B. The following table represent the field data for topographic surveying using theodolite and leveling rod :

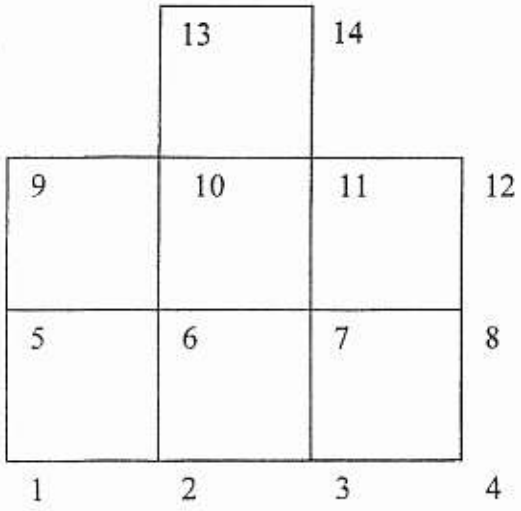
Theodolite station	Observed station	V.C.R	Rod Reading (m)			Elevation (m)
			U	M	L	
B	A	$84^0 35' 45''$	1.700	1.350	1.000	32.520
	C	$274^0 24' 45''$	---	0.500	---	?
		$276^0 18' 15''$	---	2.200	---	

Compute the elevation of point [C]. **(10 Marks)**

Q4)

A. The following table represents the horizontal (X, Y) coordinates and the ground elevation (Z) for the points of the grid shown in the figure below:

Point	X (m)	Y (m)	Z (m)
1	0	0	70.373
2	20	0	71.051
3	40	0	71.679
4	60	0	72.421
5	0	20	70.432
6	20	20	70.691
7	40	20	71.483
8	60	20	73.735
9	0	40	70.584
10	20	40	71.758
11	40	40	72.321
12	60	40	73.975
13	20	60	72.951
14	40	60	73.531



a. List the contour lines that pass through the grid using contour interval = 0.5m.

(4 Marks)

b. Compute the final elevation of the horizontal plane at which the volume of cut = volume of fill.

(8 Marks)

B. The table below represent the final cross sections for a road having bed width (b=12.0 m).

Station	Cross-Section Left	C.L.	Right	Area [Cut (m^2)]	Area [Fill (m^2)]
37+60				65.48	0.0
38+10	$\frac{f2.8}{14.4}$	$\frac{f3.2}{5.0}$ $\frac{0.0}{0.0}$	$\frac{C3.4}{4.0}$ $\frac{C2.6}{11.2}$	?	
38+35				0.0	12.5

a. Computes area of cut only at station 38+10 by coordinate method.

(5 Marks)

b. Compute volumes of cut only from station 37+60 to station 38+35 using End Area Method.

(8 Marks)

Q5)

A. In a simple circular horizontal curve the deflection angle (θ) = 33^{O}, radius of the curve R =175 m, Point of Intersection (P.I.) = Station (P.I) = 30+78.

Compute the incremental chords and the deflection angles required for laying out the curve by theodolite and tape using [1/2] [half] station.

(15 Marks)

B. A symmetrical parabolic vertical curve having length L =300 m, if the gradient of the two tangent g_1= +3% , g_2= -2% and the elevation of the Vertex (V) = (Z_v) = 98 m.

Compute the elevation of the highest (lowest) point on the curve. **(10 Marks)**