00184

THE OPEN UNIVERSITY OF SRI LANKA
BACHELOR OF TECHNOLOGY (ENGINEERING) - LEVEL5
FINAL EXAMINATION - 2011/12

CEX5230 - SURVEYING II

Time allowed: Three hours

Date : Monday, 23rd March 2012 Time: 1400 -1700 hours

Answer any five questions. All questions carry equal marks.

If you have answered more than five questions (either partly or in full), cross out the extra answers. Otherwise, only the first five answers appearing in the answer book will be evaluated.

1. Show on diagrams, how circular curves are set out by offsetting from tangent lengths and long chord. Give mathematical expressions for the offsets.

   A kerb line is to be set out between two straights, which deflect through an angle of 75° 00′ 00″ such that it forms a circular curve of radius 20m.

   a) Tabulate the data required to set out the centre line of the curve by offsets taken at exact 5m intervals along the tangent lengths. The mid-point of the curve must also be fixed.

   b) Tabulate the data required to set out the centre line of the curve by offsets taken at exact 5m intervals from the midpoint of the long chord. The mid -point of the curve must also be fixed.

2. Explain how a vertical curve can be set out in the field by tangent correction method.

   A 3% rising gradient joins a 2% falling gradient. A vertical parabolic curve 200m long is to be introduced between the two grades. Calculate the complete data set for laying out the curve. Take reduced level of the point of intersection as 350.0m and chainage as1400m. Take a peg interval of 20m.

3. Why is it necessary to have an auxiliary telescope in a theodolite used for underground surveying?

   Briefly discuss how the alignment of cross hairs of auxiliary telescope with respect to the cross hairs of the main telescope is done.

   How would you correlate and underground (tunnel) survey to surface bearings and levels when access to the main tunnel is produced through an inclined tunnel? Show measurements to be taken on sketches of an elevation and plan.

4. Explain the meanings of random error and the most probable value of a quantity. State the characteristics of the distribution of random errors. How do you overcome their effects in survey observations?

   The measured differences in level in metres between four stations A, B, C and D are given in the following table, together with the estimated weights of the values. Determine by the method of least squares the most probable values of the differences in level to the nearest 0.0001m.

From	To	Rise	Fall	Weight
A	B	5.977		3
B	C	8.550		1
C	D		2.877	2
D	A		11.665	1
D	B		5.678	3

5. Part of a triangulation scheme consists of a triangle ABC with a central point D. The measured angles are given below together with the log sins of the outer angles. State the conditions of adjustment of the figure. Thereafter select the exact number of conditions needed, and derive the normal equations required for a least square adjustment of the figure using the method of correlatives. Do not attempt to solve the equations but derive the linear relationship between the correlatives and residual errors.

Number	Angle	Angle magnitude			Log sins		Difference 1"
		°	'	"			
1	DAB	23	02	45.4	-1.5926976		49.5
2	ABD	67	43	16.1		-1.9663059	8.6
3	CBD	37	10	55.4	-1.7812882		27.8
4	BCD	24	12	01.0		-1.6127070	46.8
5	ACD	17	12	50.8	-1.4712085		68.0
6	CAD	10	38	08.3		-1.2661443	112.1
7	ADB	89	13	57.6			
8	BDC	118	37	05.7			
9	ADC	152	08	56.7			
Sum					-1.8451943	-1.8451572	

6.

(a) Discuss the properties of mass haul diagrams with particular emphasis on how they indicate the directions in which the earth should be moved. Discuss the role of balancing lines in mass haul diagrams.

(b) State and prove the prismoidal formula. Discuss the prismoidal correction.
A planimeter was used to measure the plan areas contained between the proposed position of a dam wall and several contour lines on a 1 in 10,000 scale map. The planimeter areas shown below were obtained. The proposed mean water level of the reservoir is 93m and the volume below 35m contour can be neglected. Calculate the volume of the reservoir to the nearest $1000m^3$ using prismoidal formula.

Plan area mm^2	Contour m
15690	93
12760	90
11900	85
10980	80
9750	75
7760	70
6020	65
4120	60
2100	55
950	50
240	45
30	40
20	35

7. (a) Illustrate how the image in a vertical photograph is displaced due to ground relief.

A communication tower on a flat area of ground was photographed using a camera of focal length 200mm. The distances measured from the centre of the photograph to the top and bottom of the image of the tower were 90.2 and 80.2 mm respectively. A line of 130m on the ground, measured 10.0mm on the photograph. Find the height of the tower.

(b) A hilly area was photographed from a constant flying height of 3500m above Mean Sea Level. The focal length of the camera was 175mm and its axis was truly vertical at the time of exposure. Find the largest and the smallest scales on the photograph if the ground height varied from sea level to a height of 875m.