00148

THE OPEN UNIVERSITY OF SRI LANKA
DIPLOMA IN TECHNOLOGY (CIVIL) - LEVEL 3
FINAL EXAMINATION - 2011/12

CEX3233 - SURVEYING I

Time allowed: Three hours

Date : Wednesday, 22nd February 2012 Time: 0930 -1230 hours

Answer any five questions. All questions carry equal marks. Graph paper will be provided.

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.

i. Explain with the aid of sketches how you would 'tie in' or locate a given point (e.g. a point of detail) with reference to a fixed direction (e.g. a chain line) using the following measurements:

(a) Linear measurements only;
(b) Angular measurements only;
(c) One angular measurement and one linear measurement.

ii. Show with reference to neat sketches what you consider to be the best method of dealing with each of the following cases in a survey line when only the chain, poles and a few arrows are at your disposal.

(a) Pond passable on one side only
(b) Building passable on both sides
(c) To erect a perpendicular from a point on the chain line

2.

i. It is required to carry out a chain survey of an undeveloped site.

(a) What factors should be considered when selecting station points?
(b) List five causes of errors when conducting a chain survey
(c) A tape of nominal length 30m was used to measure a site. The area of the plan of the site which was plotted to a scale of 1cm = 10m, was found to be 50.5 cm^2. After measuring and plotting the area the chain was tested again and was found to be 30.10m long. Find the true area.

ii. During the measurement in catenary of a survey line of one bay the following information was obtained:

Bay	Measured length (m)	Temp. (°C)	Difference in level between ends s (m)	Tension (N)
1	29.899	18.3	+0.064	180

The tape has a mass of 0.026kg/m and a cross-sectional area of 3.20mm^2. It was standardized on the flat at 20°C under a pull of 89N. The coefficient of linear expansion for the material of the tape is 0.000011/°C, and Young's modulus is 20.7 × 10^4 MN/m^2. Find the true length of the survey line.

3.(a) Differentiate between temporary and permanent adjustments of a vernier theodolite and list the temporary and permanent adjustments separately.

(b) Briefly discuss how (i) adjustment of cross hairs and (ii) adjustment of index frame are made.

(c) What are the advantages of making 'face right' and 'face left observations' in a theodolite survey?

4.

i. A series of levels was run with a dumpy level from an Ordance Survey bench (OBM) mark to a site to establish the reduced level of a TBM and then from the TBM to another OBM. Describe how the level will be checked and corrected on site if the bubble axis is not at right angles to the vertical axis of the instrument.

ii. The table below shows levels taken along the centre line of a proposed sewer.

Back Sight (m)	Inter Sight (m)	Fore Sight (m)	Reduced Level (m)	Distance (m)	Remarks
1.670			92.550		Bench mark
1.520		3.870		0	Ground Level
	0.910			10	Ground level
	1.590			20	Ground level
	1.770			30	Ground level
	1.660			40	Ground level
	-4.200			50	Underside of bridge
		0.720		50	Ground level

The sewer at chainage 0m has an invert level of 88.900 m and is to fall towards chainage 50m at 1 in 100.

(a) Reduce the levels and apply appropriate checks.
(b) Draw a vertical section along the centre line of the sewer on a horizontal scale of 1:500 and vertical scale of 1:50
(c) From the section determine the depth of cover at chainage points.

5. You are required to conduct a plane table survey of your campus premises.

(a) Explain how you would proceed to set up a plane table at a station.

(b) Discuss the advantages and disadvantages of the plane table as a method of surveying.

(c) Explain clearly the three point problem and how it is solved in the field.

6.

(a) In stadia tacheometry, the graduated staff may be held either vertically or at right angles to the line of sight. Compare the advantages and disadvantages of the two methods.

(b) A stadia tacheometer is sighted upon a staff held vertically upon a point. The telescope is transitted and a point B is marked in the line of sight and readings are taken on staff held vertically at that point. If the multiplying and additive constants are 100 and 0 respectively, compute the horizontal distance from A to B and the difference of level between these points. The notes of observations are as follows:

Staff Point	Vertical angle	Stadia Readings, m
A	-7° 42′	1.29/2.00/2.70
B	+ 12° 36′	1.00/1.75/2.50

7. (a) The junctions of the square grid shown below were levelled to determine the volume of excavation necessary in the construction of a basement floor. The reduced levels in m of the grid points are shown below.

×	×	×	×
185.67	186.22	187.34	187.45
×	×	×	×
186.33	187.03	187.22	187.56
×	×	×	
186.64	186.98	187.44	
×	×	×	×
187.08	187.35	187.89	187.34
×	×	×	×
187.24	187.46	188.02	187.93

The horizontal distance between the grid points is 20m and the required formation level of the basement floor foundation is to be 178.0m. Calculate the volume of the excavation within the grid area.

(b) The areas enclosed by contour lines at 5m interval for a reservoir up to the face of a proposed dam are as shown below:

Value of contour lines (m)	1010	1015	1020	1025	1030	1035	1040
Area (m^2)	500	1600	3100	8100	18200	25000	42000

Taking 1010 and 1040 m as the bottom most level and the highest water level achievable of the reservoir determine the capacity of the reservoir by either trapezoidal formula or prismoidal formula.

8. (a) List the uses of a contoured topographic map.

(b) Describe how gradients may be determined from contour plans.

(c) State the advantages and disadvantages of direct contouring and indirect contouring.

(d) The following readings were taken on a 4m staff during a contour survey by the direct method

i) 3.120 m on a B.M (Reduced Level 96.300m)
ii) 0.220m on a foresight at change point I.

The level was then moved to a new position and a reading of 1.350m taken to the change point I. Determine the staff readings required to locate the 100m and 98m contour lines.