HE OPEN UNIVERSITY OF SRI LANKA
IPLOMA IN TECHNOLOGY – LEVEL 3
INAL EXAMINATION - 2006/07

EX 3233 – SURVEYING I

150

Time allowed: Three hours

Date: Thursday, 8th March 2007 Time: 0930 – 1230 hours

Answer **any five** questions. All questions carry equal marks. *If you have attempted more than five questions, whether partly or in full, cross out the extra answers. Otherwise, only the first five answers appearing in the answer book will be evaluated.*

1. Explain *three* of the following:
   (a) The reason for taking an equal number of observations on the left and right faces of the theodolite when measuring horizontal angles.
   (b) The reason for measuring the bearings of survey lines in a compass traverse at both ends.
   (c) The reason for measuring the lengths of lines in a compass traverse using the wire chain, while in a theodolite traverse they are measured using a steel band.
   (d) The reasons for selecting the *height of collimation* method over the *rise and fall* method for reducing levels on a road project.

2. The internal angles in a traverse ABCDEA (named in the anticlockwise direction) were measured using a theodolite, and found to be as follows.
   A = 135° 00' 00", B = 77° 44' 07", C = 83° 49' 47", D = 140° 26' 25" and E = 102° 59' 41".
   Find the reduced bearings of the sides of the traverse, if the line AB is running in the direction of south.

   If the lengths of sides AB, BC, CD, DE and EA are 36.78, 57.86, 39.10, 22.85 and 35.00 metres respectively, find the length and bearing of the line BE.

3. (a) When a plane table is set up at a station it needs to be centred, levelled and oriented in the correct direction. One way of orienting the table is by using a magnetic compass. Comment on the desirability or otherwise of this procedure, giving reasons. Suggest an alternative method for achieving proper orientation. Use diagrams to illustrate your answer.

   (b) Describe in what aspects the method of *resection* differs from the other methods of plane table surveying, namely, *radiation*, *intersection* and *traversing*.

   (c) Using a diagram, describe one method by which details are located in plane table surveying.

4. Describe, with the help of a diagram, how you would test the collimation axis of a Level. Explain how you would proceed to adjust the collimation axis if the instrument is
   (a) a Dumpy level, and
   (b) a tilting level.

5. The staff readings (in metres) given below were obtained with a level. The instrument was moved immediately after the fourth reading. The figures given within brackets indicate the length of sight in metres. The first reading was taken on a benchmark with a reduced level of 82.440 m, and for the seventh reading the inverted staff was placed touching the underside of a beam.

   1.045 (*10*), 1.503 (*7*), 1.640 (*9*), **1.385** (*12*); 1.215 (*11*), 1.522 (*8*), 2.010 (*6*), **1.430** (*10*)

   The line of collimation of the instrument was checked by taking readings on a vertical staff placed on pegs A and C from instrument positions B and D. The pegs A, B, C and D were located along a straight line at 15 m intervals. These observations are given in the table below.

Inst. Stn.	Staff Stn.	Staff Reading (m)
B	A	1.300
B	C	0.980
D	A	1.420
D	C	1.130

   Correct the set of observations, and reduce these levels.

6. (a) Describe how you would obtain an idea about the ground features by studying a contour plan of the area. State whether it is possible for two contour lines of unequal elevation to cross or touch each other. Give reasons to support your answer. Use diagrams where necessary.

   (b) Describe the uses of contour plans and illustrate your answer with diagrams, where appropriate.

7. (a) The telescope in some theodolites (tacheometers) contain two pairs of stadia hairs with different spacing. Briefly explain why the extra pair is provided, and state any benefits that could be gained from this.

   (b) State the similarities and differences between *subtense bar tacheometry* and *movable hair stadia tacheometry*.

   (c) In order to establish the reduced level of the first station A in a tacheometric survey from a benchmark (BM) which was at the bottom of a hill, tacheometric observations were made as shown below. The instrument was fitted with an anallactic lens of constant 100, and the staff was held vertically.

Inst. Stn.	Inst. Height (m)	Staff Stn.	Vert. Angle	Stadia Readings (m)		
P	1.50	BM	- 2° 30'	1.32	1.66	2.00
		Change Pt.	+ 5° 00'	0.60	1.15	1.70
A	1.65	Change Pt.	- 5° 40'	1.23	1.90	2.57

   If the reduced level of the BM was 455.20 m, find the reduced level of the station A.

8. The latitudes and departures computed for a closed traverse ABCD, which runs along the straight boundaries of a plot of land, using the corrected angles and lengths of sides, are given in the table below. Determine the area of the plot of land.

Line	Latitude (m)	Departure (m)
AB	+ 27.70	+ 25.44
BC	- 12.82	+ 27.46
CD	- 53.60	- 25.28
DA	+38.72	- 27.62

Access to the land is provided through a road adjacent to the boundary AB. Divide the land into two plots of equal area giving equal road frontage for both.