



**CED 1203 – SURVEYING**

Time allowed: Three hours

Index Number .....

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Date: Thursday, 27th April 2006

Time: 0930 – 1230 hours

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Answer **any eight (8) questions from Section A and any four (4) questions from Section B.** Section A carries 20 marks, and each question in Section B carries 20 marks. You are advised to devote about 40 minutes for Section A.

Answers to Section A should be provided on the question paper itself. At the end of the examination, detach Section A from the question paper and tie it together with the book containing your answers to Section B.

*If you have answered more than four questions from Section B (either partly or fully), cross out the extra answers. Otherwise, only the first four answers appearing in the answer book will be evaluated.*

**SECTION A**

01. Show one method of chaining across a stream, and how the distance across it is measured.
  
  
  
  
  
  
  
  
  
  
02. State two of the more important factors to be considered when selecting stations for a chain survey.
  
  
  
  
  
  
  
  
  
  
03. When levelling the theodolite, after adjusting the plate bubble in two positions at right angles to each other, why do you check the bubble again following a swing of the telescope by 180°?
  
  
  
  
  
  
  
  
  
  
04. When a horizontal angle is measured with a theodolite several rounds of observation are made. Why do you start each round of observation with a different reading on the scale?  
[Use space on next page]

05. If a length is measured with a steel band by applying a pull of  $P$  when the standard pull is  $P_s$ , give a mathematical expression for the pull correction, stating the meaning of each term.
06. Why is it necessary to measure compass bearings at both ends of a survey line?
07. Briefly explain the meaning of *contour interval*.
08. What is the main difference between a Dumpy level and a tilting level?
09. The area of a plot of land can be determined either from a plotted plan, or from survey notes, or from computed coordinates of its corners. State three methods by which area can be measured from a plotted plan.
10. The volume of earthwork is computed by breaking it into smaller solids and summing up the individual volumes of such solids. This can be done in three ways; by cross sections, by contours, and by spot levels. Give an example each for the three methods.

By cross sections:

By contours:

By spot levels:

## SECTION B

11. Using clear diagrams, describe two of the following.

- (i) Testing and adjusting the trunnion (transit) axis of a theodolite.
- (ii) Testing and adjusting the vertical cross hair in the telescope of a theodolite (horizontal collimation adjustment).
- (iii) Testing and adjusting the collimation axis of a tilting level.

12. The following bearings (computed from adjusted angles) and the corrected lengths have been obtained in a closed traverse ABCDEA. The lengths of traverse lines BC and DE could not be measured.

Line	Whole Circle Bearing	Length (m)
AB	55° 48' 55"	78.24
BC	161° 46' 52"	---
CD	225° 42' 24"	84.64
DE	296° 13' 41"	---
EA	39° 18' 06"	81.64

Determine the missing lengths of the lines BC and DE. Also find the bearing and length of line AD.

13. (i) Describe the main differences between a *systematic error* and an *accidental error* with respect to how they occur, their effects on the result, and how to overcome such effects.
- (ii) Classify the following errors under systematic, accidental or gross errors, giving reasons.
  - The included angles of a traverse with six sides have been measured, and their sum is found to be 721° 00' 00".
  - The length of a line has been measured along sloping ground.
  - A building, which is nearly parallel to a chain line and plotted from offsets, is found to be much shorter than its actual length.

14. A tilting level, which is in proper adjustment, was set up at point 1 and the following readings were taken on a vertical staff placed at A, B and C respectively:

0.780, 1.255 (on inverted staff), 1.060

The level was then moved to point 2 and the following readings were taken on the vertical staff placed at C, D and E respectively:

1.310, 0.985, 1.115

After moving the level to point 3, the following readings were taken on the vertical staff placed at E and F respectively:

0.840, 0.675

Show the above information on a sketch, and briefly explain the meanings of back sight, inter sight, fore sight and change point. Book, reduce and check the levels using one of the standard methods, considering the reduced level of A to be 21.02 m AOD.

15. (i) What are the situations in which plane table surveying can be used effectively? State the disadvantages of plane table surveying as compared to other methods of surveying.
- (ii) Describe in detail, using diagrams where necessary, how you would survey a given area using a plane table and its accessories.
16. State the common principle adopted in different methods of tacheometric observations. What are the differences in procedure adopted in the two methods of each pair below?
- (i) 'fixed hair' and 'movable hair' methods of stadia tacheometry.
- (ii) 'movable hair' method of stadia tacheometry and 'subtense bar' method of tacheometry.

Two points P and Q lying on a plane hillside were observed with a tacheometer consisting of an anallactic lens ( $k = 100$ ) placed at a point A facing the hill. The graduated staff was held normal to the line of sight.

Inst. Stn.	Staff Stn.	Hor. Circle	Ver. Circle	Stadia Readings (m)		
A	P	42° 20'	+ 8° 00'	0.840	1.280	1.720
A	Q	80° 30'	+ 12° 30'	1.030	1.650	2.270

Find the horizontal distance between P and Q and the slope of the line PQ.

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