# SURVEYING
## (CIV2104)

**Time Allotted : 2½ hrs** **Full Marks : 60**

***Figures out of the right margin indicate full marks.***

***Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.***

***Candidates are required to give answer in their own words as far as practicable.***

## Group – A

1. Answer any twelve: **12 × 1 = 12**

*Choose the correct alternative for the following*

(i) In this type of survey curvature of the earth is taken into consideration
(a) Plane survey (b) Geodetic survey
(c) Contouring (d) Chain survey

(ii) If the tangent distance of a curve is 242m and deflection angle is 36 degree, then the length of the curve is
(a) 246m (b) 492m (c) 632m (d) 783m

(iii) Closing error correction can be performed using the following method
(a) Rise and Fall method (b) Method of ranging
(c) 3-4-5 method (d) Bowditch rule

(iv) A 30m metric chain is found to be 10 cm too short throughout a measurement. If the distance measured is recorded as 300 m, then the actual distance is
(a) 300.1 m (b) 301.0 m (c) 299.0 m (d) 310.0 m

(v) If the least count of the main scale of a vernier theodolite is 20 minute, then range of vernier scale will be
(a) 0 – 10 (b) 0 – 20 (c) 0 – 30 (d) 0 – 40

(vi) Angles of simple triangulation figures for triangles should not be less than
(a) 45 degree (b) 30 degree
(c) 60 degree (d) 90 degree

(vii) The correction for sag is
(a) Always additive
(b) Always subtractive
(c) Always zero
(d) Sometimes additive and sometimes subtractive

(viii) Solution of three point problem is
(a) Analytical solution (b) Graphical solution
(c) Mechanical solution (d) All the above

(ix) The following sights are taken on a "change point"
(a) Fore sight only (b) Back sight only
(c) a and b (d) Fore sight and intermediate sight

(x) Area of any irregular figure of the plotted map is measured with
(a) Pentagraph (b) Sextant
(c) Clinometer (d) Planimeter

*Fill in the blanks with the correct word*

(xi) Length of each link for a 20m chain is _____.

(xii) Measurement of under water depth is known as _____

(xiii) The least count of prismatic compass is _____.

(xiv) Method of repetition is related to _____ traversing.

(xv) Difference in angle between geographical north and magnetic north is known as _____.

## Group - B

2. (a) Illustrate different parts of a 30m metric chain with their use. *[(CIV 2104.1)(Remember/LOCQ)]*

(b) What is meant by ranging in chain survey? *[(CIV 2104.1)(Understand/LOCQ)]*

(c) The following are the bearings of closed traverse mentioned in Table 1, determine the included angle.

**Table 1**: Bearings of the traverse

| Line | Fore bearing | Back bearing |
|---|---|---|
| **AB** | 160°30' | 340°30' |
| **BC** | 30°45' | 210°45' |
| **CD** | 310°45' | 130°45' |
| **DE** | 225°30' | 45°30' |
| **EA** | 137°45' | 317°45' |

*[(CIV 2104.1)(Apply/IOCQ)]*

**2 + 2 + 8 = 12**

3. The following data shown as (×) in the Table 2 of a level are missing due to exposure of sudden rainfall. Determine the missing data. Rebook all the data and apply usual checks.

**Table: 2: Level book data**

| Station | BS | IS | FS | HI | RL | Remarks |
|---|---|---|---|---|---|---|
| 1 | × | | | 134.600 | 132.385 | BM |
| 2 | | × | | | 132.995 | |
| 3 | 2.080 | | 0.985 | × | × | CP |
| 4 | | × | | | 132.940 | |
| 5 | 0.605 | | × | × | 134.440 | CP |

| Station | BS | IS | FS | HI | RL | Remarks |
|---|---|---|---|---|---|---|
| 6 | | × | | | 133.070 | |
| 7 | | 1.045 | | | × | |
| 8 | | | × | | 132.360 | Last point |

*[(CIV 2104.1)(Analyse/HOCQ)]*

**12**

## Group - C

4. (a) A tacheometer was set up at station P and observations were made to a staff held normal to the line of sight over point Q. The vertical angle measured was 6°36'. The three hair readings were 1.905, 2.480 and 3.055. The reading from P, with the line of sight horizontal to a benchmark of reduced level (RL) 852.55 was 1.855. If the instrument constants are 100 and 0.5, evaluate the RL of Q.

*[(CIV 2104.1,CIV 2104.2)(Analyse/HOCQ)]*

(b) Explain the following terms:
(i) Face left and face right condition in theodolite
(ii) Transit theodolite
(iii) Least count of a theodolite
(iv) Use of bubble tube in a theodolite. *[(CIV 2104.1)(Understand/LOCQ)]*

**8 + 4 = 12**

5. The perpendicular offsets taken from chain line to an irregular boundary are given in Table 3. Evaluate the area enclosed between the survey lines by trapezoidal rule and Simpson's rule.

**Table: 3: Offset data**

| Chainage | 0 | 5 | 10 | 15 | 20 | 30 | 40 | 50 | 70 | 90 |
|---|---|---|---|---|---|---|---|---|---|---|
| Offset | 2.54 | 3.98 | 5.55 | 10.58 | 12.96 | 8.25 | 15.02 | 10.00 | 12.54 | 3.22 |

*[(CIV 2104.1, CIV 2104.2)(Analyse/IOCQ)]*

**12**

## Group - D

6. (a) Compare various triangulation systems. *[(CIV 2104.5,CIV 2104.6)(Understand/LOCQ)]*

(b) Write short note on 'tower' in triangulation survey.

*[(CIV 2104.5,CIV 2104.6)(Remember/LOCQ)]*

(c) Describe various 'signals' in triangulation survey. *[(CIV 2104.5,CIV 2104.6)(Remember/LOCQ)]*

**3 + 5 + 4 = 12**

7. (a) Outline the process of setting out of simple circular curve by Rankine's method.

*[(CIV 2104.3)(Understand/IOCQ)]*

(b) Evaluate the super elevation required for a narrow gauge railway track in a circular curve with radius 300m and maximum velocity 30 km/Hr.

*[(CIV 2104.3)(Apply/IOCQ)]*

**8 + 4 = 12**

## Group - E

8. (a) State and explain the term "EDM". *[(CIV 2104.5,CIV 2104.6)(Understand/LOCQ)]*

   (b) Describe the working principle of the following instruments:
   (i) Geodimeter
   (ii) Tellurometer
   (iii) Distomats. *[(CIV 2104.5,CIV 2104.6)(Understand/LOCQ)]*

   (c) State and explain the classification of EDMs based on the type of carrier wave employed. *[(CIV 2104.5,CIV 2104.6)(Understand/LOCQ)]*

**3 + 3 + 6 = 12**

9. (a) Discuss the importance of accurate sounding for navigation and underwater mapping, and highlight the advantages and limitations of these methods. *[(CIV 2104.4,CIV 2104.6)(Understand/LOCQ)]*

   (b) Explain the concept of sounding in hydrographic surveying and describe the various methods used for locating soundings. *[(CIV 2104.4,CIV 2104.6)(Understand/IOCQ)]*

**6 + 6 = 12**

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| Cognition Level | LOCQ | IOCQ | HOCQ |
|---|---|---|---|
| Percentage distribution | 39.6 | 39.6 | 20.8 |