

**SURVEYING
(CIVL 2203)**

Time Allotted : 3 hrs.

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

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

**Group - A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) The vertical distance between two adjacent contour lines is called
(a) Contour gradient (b) Contour interval
(c) Vertical equivalent (d) Horizontal line.
- (ii) In WCB system a line is said to be free from local attraction if the difference between FB and BB is
(a) 0° (b) 180° (c) 90° (d) 360°
- (iii) The first reading taken on a bench mark or change point is known as
(a) Back sight (b) Fore sight
(c) Intermediate sight (d) Transverse sight.
- (iv) If the whole circle bearing of a line is 237°45'30", then its quadrantal bearing is
(a) S57°45'30"W (b) S47°45'30"E
(c) S32°14'30"W (d) S32°14'30"E.
- (v) If the magnetic bearing of a line is designated as SW in the quadrantal system, then the whole circle bearing of the line will be between
(a) 0° to 90° (b) 90° to 180°
(c) 180° to 270° (d) 270° to 360°.
- (vi) An alidade used with the plane table is used for
(a) centring the plane table (b) sighting objects
(c) levelling the plane table (d) determining distances of objects.
- (vii) A plane table is oriented by the
(a) method of radiation (b) method of back sighting
(c) method of intersection (d) using plumb bob.
- (viii) When you transit the telescope, you rotate the telescope about the
(a) Vertical axis (b) Trunion axis
(c) Optical axis of the telescope (d) Line of collimation.

- (ix) A 2° curve of chord length 20 m has a radius of
 (a) 573m (b) 286.5m (c) 143m (d) 72.5m.
- (x) An obstacle which obstructs both chaining and ranging may be
 (a) Building (b) Lake (c) Hillock (d) Electric pole.

Group - B

2. (a) State and explain the principles of surveying with neat diagram. [(CO1)(Remember/LOCQ)]
- (b) Classify various types of chains. Demonstrate the advantages and disadvantages of chain survey. [(CO1)(Remember/LOCQ)]
- (c) The bearings of the sides of a triangle ABC as shown in Figure 1 are given in Table 1. Determine the included angles. [(CO1)(Determine/HOCQ)]

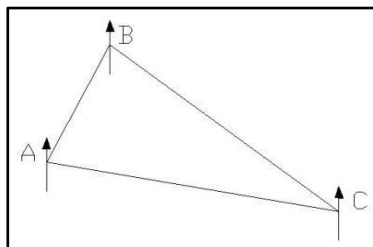


Fig. 1

Table 1: Bearings of the sides of triangle ABC

Line	Forward bearing	Backward bearing
AB	48°	228°
BC	136°	316°

4 + 4 + 4 = 12

3. (a) Apply the concept of error correction due to sag and find out the correct length for a 30m long steel tape under a pull of 115N in three equal spans of 10m each. Steel weighs at 0.075N per cc. Sectional area of the tape is 0.1 cm². [(CO1)(Apply/IOCQ)]
- (b) Illustrate different parts of a 30m metric chain with their use. [(CO1)(Understand/LOCQ)]
- (c) The bearings in the quadrantal system observed while traversing with a compass and chain are given in Table 2. Determine the local attraction at the affected stations and also the corrected bearings.

AB	S36°15'E	BA	N36°15'W
BC	S44°30'W	CB	N45°30'E
CD	N71°45'W	DC	S71°00'E
DE	N14°00'E	ED	S14°30'W
EA	N61°15'E	AE	S61°00'W

Table 2: Quadrantal bearings of lines

[(CO1)(Evaluate/HOCQ)]
4 + 2 + 6 = 12

Group - C

4. The following staff readings were recorded in a levelling operation: 1.185, 2.604, 1.925, 2.305, 1.155, 0.864, 1.105, 1.685, 1.215, 1.545 and 0.605.

'A' is the benchmark of reduced level (RL) 185.685m. Determine the RLs of all the other points by both the methods (Height of instrument method and Rise and Fall method). The first reading was to point 'A' and the instrument was shifted after the readings 2.604, 0.864 and 1.125. [[CO2](Evaluate/HOCQ)]

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5. (a) 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. [[CO3](Understand/LOCQ)]
- (b) 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.

[[CO3](Evaluate/HOCQ)]

4 + 8 = 12

Group - D

6. (a) Determine the area between a boundary line and a survey line following the perpendicular offsets as shown in Table 3. Use (i) Trapezoidal rule and (ii) Simpson's rule.

Distance along the chain line (m)	0	10	20	30	40	50	60	70	80
Perpendicular offset (m)	0	4	7	9	12	15	14	8	3

Table 3: Chainage and perpendicular offset values

[[CO4](Evaluate/HOCQ)]

- (b) Estimate the volume of earthwork in a road cutting 60m long from the data given in Table 4.

Width of formation	15m
Side slope	1.25 to 1
Average depth of cutting along the centre line	7.5m
Transverse slope of the ground	12 to 1

Table 4: Data for volume of earthwork.

[[CO4](Create/HOCQ)]

6 + 6 = 12

7. (a) The length of the long chord of a simple circular curve of radius 400 m is 100 m. Estimate the lengths of the perpendicular offsets from the long chord at 10m intervals. [[CO5](Create/HOCQ)]

- (b) Explain the following terms with neat sketches:
 (i) Deflection angle (ii) Back tangent (iii) Centrifugal ratio (iv) Transition curve [[CO5](Understanding/LOCQ)]

(4 × 2) + 4 = 12

Group - E

8. (a) Explain the following in view of hydrographic survey (Provide figures wherever required):
 (i) Controls (ii) Measurement procedures of tides
 (iii) Method of sounding (iv) Mean sea level
 [(CO6)(Understanding/LOCQ)]
 (b) Explain the term bathymetry. [(CO6)(Understanding/LOCQ)]
(4 × 2.5) + 2 = 12
9. (a) Explain different grades of triangulation. [(CO6)(Understanding/LOCQ)]
 (b) Explain ***any two*** from the following:
 (i) Vertical photograph (ii) Tilted photograph (iii) Oblique photograph
 [(CO6)(Understanding/LOCQ)]
6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	43.75	4.17	52.08

Course Outcome (CO):

After the completion of the course students will be able to

1. Study the basics of linear/angular measurement methods like chain surveying, compass surveying.
2. Understand the concepts of leveling and contouring.
3. Demonstrate the method of theodolite survey in terms of elevation and angular measurements, along with tacheometry.
4. Calculate the area and volume of any given land using different methods and rules.
5. Understand the method of setting out procedure of horizontal and vertical curves.
6. Explain various methods of higher surveying, such as triangulation, hydrographic survey, areal photogramatry and demonstrate the basic functions of advanced instrument like Total station.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question