

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) If the declination is 5°40' W, which one of the following magnetic bearing would represent the true bearing of S 25°20' E?
(a) S 19° 20' E (b) S 31° 0' E (c) S 20° 0' E (d) S 19° 20' W.
 - (ii) For a maximum velocity of 60kmph for a broad gauge line, find out the super elevation required. Radius of the curve is 350m.
(a) 136mm (b) 146mm (c) 236mm (d) 126mm.
 - (iii) The angle between the true meridian and magnetic meridian at the time of observation is known as
(a) Dip (b) Bearing
(c) Magnetic bearing (d) Magnetic declination.
 - (iv) The following sights are taken on a “change point”
(a) Fore sight only (b) Backsight only
(c) Foresight and backsight (d) Foresight and intermediate sight.
 - (v) 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°.
 - (vi) The correction for sag is
(a) always additive
(b) always subtractive
(c) always zero
(d) sometimes additive and sometimes subtractive.
 - (vii) 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.

- (viii) Radar is an acronym for
 (a) Radiation and ranging (b) Ratio detection and ranging
 (c) Radiation and response (d) Radiation and reporting
- (ix) For roads the maximum value of centrifugal ratio is taken to be
 (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$.
- (x) The spiral angle of a transition curve will be given by the equation
 (a) $L^2/2R$ (b) $L/2R$ (c) $2R/L$ (d) $2R/L^2$.

Group- B

2. (a) What is meant by representative fraction? Write in brief on diagonal scale. Explain the procedure to construct a diagonal scale 1 cm = 3 metres. [[CO1](Remember/LOCQ)]
- (b) State and explain the principles of surveying. [[CO1](Understand/LOCQ)]
- (c) Define the following terms: (i) Local attraction (ii) Dip angle (iii) Magnetic declination. [[CO1](Remember/LOCQ)]

4 + 2 + 6 = 12

3. (a) The whole circle bearings of a traverse are recorded as given in Table 1. Develop the corresponding reduced bearings.

Table 1: Whole circle bearings of the traverse

Line	AB	BC	CD	DE
Bearing	90°00'	110°30'	220°30'	355°47'

[[CO1](Apply/IOCQ)]

- (b) Explain the term local attraction. [[CO1](Understand/LOCQ)]
- (c) The following Table 2 consists of the bearings of a closed traverse with compass, an area where local attraction was suspected. Solve for included angle of traverse and correct them if necessary.

Table 2: Bearings of the traverse

Line	Fore bearing	Back bearing
AB	165°30'	345°30'
BC	40°45'	221°45'
CD	315°45'	135°45'
DE	250°30'	69°30'
EA	120°45'	300°45'

[[CO1](Apply/IOCQ)]**4 + 2 + 6 = 12****Group - C**

4. (a) The following staff readings were recorded with a dumpy level on continuously rising ground at common interval of 30m. If the RL of first point was 450.500m, calculate RL of other points by Rise and Fall method. Apply usual checks.
 3.600, 2.985, 1.715, 0.395, 3.880, 2.535, 1.985, 1.020, 0.485, 3.950, 2.690, 1.560, 1.230 and 0.655. [[CO2](Evaluate/HOCQ)]

- (b) Explain curvature and refraction correction with neat sketch.

[[CO2](Understand/LOCQ)]

10 + 2 = 12

5. (a) Explain the followings terms

- i. Transit theodolite
- ii. Method of repetition
- iii. Face left and face right condition
- iv. Least count of theodolite.

[[CO3](Understand/LOCQ)]

- (b) A closed traverse with a theodolite was conducted round an obstacle and the observation was made as shown in Table 3. Determine the missing values.

Table 3: Theodolite traverse reading

Line	Length	Azimuth
AB	500	98°30'
BC	620	30°20'
CD	468	298°30'
DE	?	230°00'
EA	?	150°00'

[[CO3](Evaluate/HOCQ)]

4 + 8 = 12

Group - D

6. Following are the details of railway embankment

Emankment width : 12m

Side slopes : 1.5 to 1

Ground levels at every 50m along the centre line is presented in Table 3.

Table 3: Ground levels at every 50m along the centre line

Chainage	0	50	100	150	200	250	300	350	400
Reduced Level	505.14	501.98	499.02	498.40	496.75	499.05	499.33	499.75	500.41

Calculate the total volume of earthwork. The formation level at zero chainage is 501.745m and the embankment has a falling gradient of 1 in 100. The ground is leveled across the centre line.

[[CO4](Evaluate/HOCQ)]

12

7. A road bend which deflects 80° is to be designed for a maximum speed of 100 km per hour, a maximum centrifugal ratio of 1/4 and a maximum rate of change of acceleration of 30 cm/sec³. The curve consists of a circular curve combined with two cubic spirals as transition curves. Chainage of point of intersection is 42862 m. Calculate

- (i) The radius of the circular arc
- (ii) The requisite length of transition
- (iii) The total length of composite curve
- (iv) The chainage of the beginning, end of transition curve and junction points.

[[CO5](Evaluate/HOCQ)]

(3 + 3 + 3 + 3) = 12

Group - E

8. (a) Explain in details various equipment used for measurement of sounding. [[CO6](Understanding/LOCQ)]
(b) Explain various types of surveying that can be performed using Total station instrument. What are the different types of targets available in a total station and what are their use? [[CO6](Understanding/LOCQ)]
6 + 6 = 12
9. (i) Illustrate some applications of photogrammetry.
(ii) What are the limitations of photogrammetry?
(iii) State in tabular form the difference between terrestrial and areal photogrammetry.
(iv) State and explain tide gauges. [[CO6] (Understanding/LOCQ)]
(4 + 1 + 3 + 4) = 12
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Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	45.83	10.42	43.75

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 photogrammatry 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