SURVEYING
(CIVL 2203)

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) The spiral angle of a transition curve will be given by the equation
(a) $L^2/2R$ (b) $L/2R$ (c) $2R/L$ (d) $2R/L^2$.

(ii) Radar is an acronym for
(a) radiation and ranging (b) ratio detection and ranging
(c) radiation and response (d) radiation and reporting.

(iii) 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.

(iv) A transition curve is essentially used to
(a) generate more frictional forces for stability
(b) allow vehicles to have increased speed while driving
(c) neglect the effect of centrifugal forces
(d) avoid abrupt change in radius from a straight line to a finite radius curve.

(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) 240°.

(vi) 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.

(vii) In this type of survey curvature of the earth is taken into consideration
(a) plane survey (b) geodetic survey
(c) contouring (d) chain survey.

(viii) 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

(ix) 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.

(x) The process of turning the telescope about the horizontal axis in vertical plane is known as

(a) Transiting (b) Reversing
(c) Plunging (d) Swinging.

Fill in the blanks with the correct word

(xi) Dumpy level is used in _____.

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

(xiii) Reduced bearing value of 190˚35' is _____.

(xiv) Latitude of S 30˚30'W will be _____.

(xv) Gauge length of broad gauge railway line is _____.

Group - B

2. (a) Illustrate the process of construction of a diagonal scale 1 cm = 4 meters and show 62.4 m on that. *[(CO1)(Understand/LOCQ)]*

(b) Outline the term with example, "Representative fraction". *[(CO1)(Understand/LOCQ)]*

10 + 2 = 12

3. (a) Explain the term "Magnetic declination". Illustrate the term "Local attraction". Explain the detection and elimination process of local attraction. *[(CO1)(Understand/LOCQ)]*

(b) A 100 m tape is suspended between the ends under a pull of 250N. The weight of the tape is 35 N. Evaluate the correct distance between the tape ends. *[(CO1)(Evaluate/HOCQ)]*

(c) State the principles of surveying. *[(CO1)(Remember/LOCQ)]*

(2 + 2 + 2 + 2) + 2 + 2 = 12

Group - C

4. A tacheometer was set up at station P and observations were made to a staff held vertical presented in Table 2. The instrument was fitted with an anallactic lens and constant is 100. Determine horizontal distance to staff station and vertical distance of axial reading above or below the instrument. Find RL of Q. RL of M = 1958.3m.

Table 2: Tacheometer readings

Instrument station	Staff station	Vertical angle	Staff readings
P	BM	-4°22'	1.05, 1.03, 1.1
P	Q	+10°	1.95, 2.055, 2.158

[(CO3)(Evaluate/HOCQ)]

12

5. 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
6		×			133.070	
7		1.045			×	
8			×		132.360	Last point

[(CO2)(Evaluate/HOCQ)]

12

Group – D

6. (a) Evaluate the volume of earth work in a road cutting 60 m long from the following data:
Width of formation = 15 m
Side slope = 1.25 to 1
Average depth of cutting along the centre line = 7.5 m
Transverse slope of the ground = 12 to 1. *[(CO4)(Evaluate/HOCQ)]*

(b) Outline the process of setting out of simple circular curve by Rankine's method. *[(CO5)(Understand/LOCQ)]*

(c) Evaluate the super elevation required for a narrow gauge railway track in a circular curve with radius 300m and maximum velocity 30 km/Hr. *[(CO5)(Evaluate/HOCQ)]*

6 + 4 + 2 = 12

7. (a) 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

[(CO4)(Evaluate/HOCQ)]

(b) Illustrate with figure the term "Shift of circular curve". Explain the term "Spiral angle". *[(CO5)(Understand/LOCQ)]*

(5 + 5) + 2 = 12

Group - E

8. (a) Explain various triangulation systems in brief. *[(CO6)(Understand/LOCQ)]*

(b) Illustrate various uses of Total station instrument. *[(CO6)(Understand/LOCQ)]*

(c) Explain the use of Prism in Total station instrument. Explain various applications of Photogrammetry. *[(CO6)(Understand/LOCQ)]*

4 + 6 + 2 = 12

9. (a) Explain the term bathymetry. *[(CO6)(Understand/LOCQ)]*

(b) What is meant by strength of figure? *[(CO6) (Remember/LOCQ)]*

(c) Explain the following:
(i) Vertical photograph (ii) Tilted photograph (iii) Oblique photograph *[(CO6)(Understand/LOCQ)]*

2 + 4 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	54.16	0	45.83

Course Outcome (CO):

After the completion of the course students will be able to

CIVL 2203.1. Study the basics of linear/angular measurement methods like chain surveying, compass surveying.
CIVL 2203.2. Understand the concepts of leveling and contouring.
CIVL 2203.3. Demonstrate the method of theodolite survey in terms of elevation and angular measurements, along with tacheometry.
CIVL 2203.4. Calculate the area and volume of any given land using different methods and rules.
CIVL 2203.5. Understand the method of setting out procedure of horizontal and vertical curves.
CIVL 2203.6. 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.*