BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
FIRST SEMESTER 2023-2024
SURVEYING (Comprehensive Exam) – Closed book

Course No: CE F213   **Date: 09-12-2023 (Saturday)**
Duration: 90 Mins (Closed book)   **Max. Marks: 40**

I: Choose the best answers: [**10 x 1 = 10**]

1) Map generally does not contain the dimensions where plan contains dimensions (True/False)
2) The perpendicular offset at junction point is _____ the value of shift.
3) Tacheometer and theodolite are one and the same (True/False)
4) The whole circle bearing corresponding to S 30-degree E is _____
5) Chain and compass traversing is also known as _____
6) Trapezoidal rule is applicable only for odd number of offsets (True/False)
7) The combined effect of curvature and atmospheric refraction is _____ ($0.06735\ d^2$; $0.6735\ d^2$; $0.006735\ d^2$) where d is in kilometers.
8) Wholly transitional curves are more safe than the composite curves (True/False)
9) The line joining the points of equal declination is known as isogonic lines (True/False)
10) The purpose of Anallactic lens is to make additive constant zero (True/False)

II: Short answers: [**10 x 3 =30**]

1) Define simple circular curve and compound curve.
2) Calculate the length of the transition curve when the rate of radial acceleration is 30 cm/s^3. Allowable speed on curve is 70 kmph. The radius of the circular curve is 200 m.
3) If the summation of rise is zero, what does it indicate?
4) What is the purpose of alidade? Why orientation by back sighting is preferred?
5) What is meant by length of vertical curve? What is the typical concern of valley curve?
6) What is meant by resection?
7) The distance between two points, measured with a 20 m chain was recorded as 325 m. It was found afterwards that the chain was 3 cm too short. What was the true distance between the points?
8) Why parabolic curves are preferred over the circular curves for the vertical curves?
9) What is reconnaissance survey? Why is it needed?
10) Briefly highlight the characteristics of contours pictorially.

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Long answers: **[4 x 10 = 40]**

1) A composite curve is to be set out with the following data: Deflection angle = 60^0. Maximum speed of the vehicle = 100 kmph; Centrifugal ratio = 1/8; Rate of change of radial acceleration = 0.3 m/s^3. Chainage at the point of intersection = 1150 m. Calculate the following

a) Radius of the circular curve; b) Length of the transition curve   [4]
c) Chainages of tangent points and junctions of transition curve with circular curves.   [3]
d) Necessary data to set out the circular curve using "offsets using chords produced" and transition curve using "total deflection angles"   [5]

2) The following are the data with respect to tacheometric survey (staff held vertical).

Instrument station	Height of instrument (m)	Staff station	Vertical angle	Stadia Hair readings (m)
O	1.500	A	5 deg 30 minutes	1.155, 1.755, 2.355
O	1.500	B	12 deg 30 minutes	1.250, 2.000, 2.750

The RL of instrument station is 150.00 m. The whole circle bearing of AO and BO are given as 210 degrees and 270 degrees. Determine the RL of A and B, distance AB and gradient of the line AB. The constants of the instrument are 100 and 0.   [10]

3) A page of a level book with some missing readings (xxx) is reproduced below. Fill in the missing entries along with the necessary arithmetic checks.   [10]

Station	BS (m)	IS (m)	FS (m)	RISE (m)	FALL (m)	RL (m)	Remarks
1	3.650					108.260	
2		xxx		2.750			
3		2.830					
4		3.640					
5	xxx		2.420				
6		2.410			1.320		
7		2.320					
8		3.000					
9		-2.170					Staff held against the ceiling

| 10 | xxx | | xxx | | 2.750 | | |
| 11 | | | xxx | | 1.320 | | |

4 (a) Two ranging rods, one of length 3 m and the other of 1.5 m, were used in an effort to determine the height of an inaccessible tower. In the first setting, the rods were so placed that their tops were in line with the top of the tower. The distance between the rods was 15 m. In the second setting, the rods were ranged on the same line as before. This time the distance between the rods was 30 m. If the distance between the two longer rods was 90 m, find the height of the tower.   [5]

4 (b) Neglecting the spherical excess, adjust the angles of a triangle of which the observed values are   [5]

Angle A: 50 deg 50 min 50 sec   ----- **Weight =3**

Angle B: 45 deg 45 min 50 sec   ------ **Weight = 2**

Angle C: 82 deg 20 min 20 sec   -------**Weight = 2**