



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Assume suitable data whenever necessary.
 9. Illustrate your answers whenever necessary with the help of neat sketches.
 10. Use of non programmable calculator is permitted.

1. a) Derive the equation $D = K \cdot S + C$ as used in fixed hair method of tacheometry. **6**
- b) To find the RL of B, two observation are taken by a theodolite from station A – one to a BM and other to the station B. The records are as follows: **7**

Inst. station	Staff station	Target	Vertical angle	Staff reading	Remark
A	BM	Lower	-10°0'	0.655	RL of BM
		Upper	-7°0'	2.655	= 510.500m
	B	Lower	-5°0'	1.250	
		Upper	+4°0'	3.200	

Find RL of B and distance between the BM and station B.

2. a) Write short note on Errors in stadia surveying. **5**
- b) A tacheometer was set up at a station A and the reading on the vertically held staff at B were 2.255, 2.605 and 2.955 the line of sight being at an inclination of $+8^\circ 24'$, another observation on the vertically held staff at BM gave the readings 1.640, 1.920 and 2.200 the inclination of line of sight being $+1^\circ 6'$. Calculate horizontal distance between A and B and the elevation of B if the RL of BM is 418.685m the constant of instrument were 100 and 0.3. **6**
- c) What is tacheometry and what are the different systems of tacheometric measurement? **2**
3. a) Describe the method of setting a simple circular curve by a Rankine's deflection angle method. **6**
- b) Two tangents intersects at chainage 1200m, the deflection angle being 86° . Calculate all the data for setting out circular curve with a radius of 300 m by offset from chord produced. Take the peg interval as 30m. **7**
4. a) Define vertical curve. With neat sketches classify vertical curve and explain how to find out length of vertical curve. **5**

- b) A reverse curve is to be set out between two parallel tangents 30m apart. The line joining the two tangent points is 300m. The two arc of the curve have same radius. Calculate the necessary data to set the curve on the field by offset from long chord at the interval of 20m from common tangent point. **8**
5. a) Explain in details the different methods for determining the length of transition curve. **5**
- b) A composite curve is to be set out with the following data. Deflection angle = 60° , Maximum speed of vehicle = 80 km ph, centrifugal ratio = $\frac{1}{8}$, Rate of change of radial acceleration = 0.3 m/sec^3 , Chainage of intersection point = 1150m Calculate
 i) Radius of circular curve. ii) Length of transition curve.
 iii) Chainage of tangent point & junction of transition curve with circular curve.
 iv) Total length of the composite curve. **9**
6. a) Prove that the shift = $\frac{L^2}{24R}$ where, L is the Length of transition curve and R is the radius of circular curve. **6**
- b) Two clothoid spirals for a road transition between two straights meet at a common tangent point. If the deflection angle between the straights is 30° , the chainage of P.I. 6387 meters and the maximum speed 120 km/hour. Calculate the chainage of tangent points and the points on compound curvature. The curve may be designed on the basis of comfort condition of centrifugal ratio (safety condition) **8**
7. a) Write short notes on triangulation system. **5**
- b) The altitude of two proposed station A and B 130 km apart are respectively 220 m and 1160 m. The altitude of the two points C and D on a profile between them are respectively 308 m and 632 m. The distance AC = 50 km and AD = 90 km. Determine whether A and B are intervisible and if necessary find the minimum height of a scaffolding at B assuming A as the ground station such that new line of sight clears the peak by 3 m. **8**
8. a) The following angle was observed from central station to the surrounding stations of a triangulation survey. **9**
 A = $93^\circ 43' 22''$ weight 3
 B = $74^\circ 32' 39''$ weight 2
 C = $101^\circ 13' 44''$ weight 2
 D = $90^\circ 29' 50''$ weight 3
 In addition one angle (A + B) was measured separately as combined angle with a mean value of $168^\circ 06''$ (weight 2)
 Determine most probable value of the angle A, B, C and D.
- b) What is mean by satellite station and Reduction to centre. **4**
9. a) Explain in details terrestrial photography. **6**
- b) A tower AB is 50m high and the elevation of its bottom B is 750 m above mean sea level. The distance of the image of the tower on a vertical photograph, taken at a flight altitude of 2000 m above mean sea level is 8.42 cm. Compute the displacement of the image of the top of the tower with respect to the image of its bottom. **7**

10. a) Obtain an expression for the number of photographs required for a given area of lengths and width for such a survey. **6**
- b) Two points A and B having elevations of 600m 300 m respectively above datum appears on the vertical photograph having focal length of 20 cm and flying altitude of 2500 m above datum. Their corrected photographic co-ordinates are as follows: **7**

Point	Photographic x (cm)	co-ordinates y (cm)
a	+ 2.65	+ 1.36
b	-1.92	+ 3.65

Determine the length of the ground line AB.

11. a) Explain in brief about EDM? Write its types and uses. **7**
- b) What is remote sensing? And explain remote sensing system. **7**
12. a) Define GIS and explain its components and advantages. **7**
- b) What is Raster model and write its advantages and disadvantages. **7**
