

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
 First Semester (2022-2023), Comprehensive Test
 Course: Surveying (CE F213)

Date: 27th Dec. 2022

Max. Marks: 80

Duration: 9:00 AM-12:00 NOON

Q.1. Calculate the latitudes, departures and closing error of the following traverse. Adjust the traverse by Transit Rule. [12]

Line	Length(m)	FB of lines (W.C.B)
AB	120.34	125° 45'
BC	100.1	80° 4'
CD	180.8	24° 25'
DE	104.65	271° 55'
EA	200.5	235° 35'

Q.2. A road 7m wide is to deflect through an angle of 45° with centerline radius of 350m. The chainage of the intersection point is 3350m. A circular arc is to be provided with transition curves in the form a cubic parabola at the ends of circular curves, of such lengths that the rate of change of radial acceleration can be maintained as 0.45m/s² per second. The speed of the vehicle is 60 Km/hour. Find out the followings, [8]

- (a) Length of transition curves and circular curve
- (b) Superelevation
- (c) Chainage of all junction points
- (d) Find out the offsets of transition curves at an interval of 8m.

Q.3. The boundary of a patch of land from a chain line is given as a function as $y = 10 + 0.1x - 10^{-5}x^3$. The length of chain line is 100m. Find the area of the land using (i) Trapezoidal rule, (ii) Simpson's 1/3 rule, (iii) Simpson's 3/8 rule, (iv) Average ordinate rule and (v) co-ordinate method, by dividing the chain line in 10 divisions. Check the result with exact integration. [10]

Q.4. The deflection angle of two straight roads is 50° and these two roads meet at a chainage of 3100m. To join both the roads by a simple circular curve with radius 250m, a setting out work has to be carried out. Find the required data for this work by (i) offset from chord produced (taking 20m chain) and (ii) perpendicular offset from tangent (taking 15m interval and using exact expression). [15]

Q.5. Find the actual volume of the reservoir from the data given in the table between level 110m and 150m. The data is from a plan which is drawn in the scale of 1cm= 20m. Use trapezoidal and prismoidal rule. [10]

Contour(m)	110	115	120	125	130	135	140	145	150
Area(cm ²)	55	70	77.5	120	150	210	255	300	355

- Q.6. A tacheometer was kept at O and the staff was kept at two different points A and B. The staff was kept vertical during observations. The data collected is mentioned below, [10]

Instrument at	Staff at	Vertical angle	Staff reading in m
O	A	$5^{\circ} 20' 45''$	1.005, 1.755, 2.505
	B	$-4^{\circ} 45' 20''$	0.750, 1.250, 1.750

The RL of the point A is 200.5m and height of the instrument is 1.35m. The WCB of line OA is $33^{\circ} 25'$ and of line OB is $100^{\circ} 0' 50''$. Find the distances OA, OB and AB. Find the gradient of line AB. Also, find the RL of point O. Take $K=100$ and $C=0.2$.

- Q.7. The following observations are made in a reciprocal levelling operation, [10]

Instrument near station	Staff reading on (in m)		Remark
	A	B	
A	1.405	0.795	The distance from A to B is 1000.5m. The R.L. of point B is 320m.
B	0.555	1.355	

Find the true RL of A, collimation error and correct reading at B.

- Q.8. Determine the normal tension of a steel tape supported between two supports 7.65m apart. Consider the standard tension as 75N, the weight of the tape as 0.75N/m, the cross-sectional area as 4.5 mm^2 and the E as 210GPa. [5]