ID : 7966

SECTION : B

SEMESTER : 4th

DEPT : Civil

Question # 01 (a)

Tangent meet at chainage = 7966 ft

Deflection angle = $14^\circ 13' 23''$

Degree of curve = 5°

Solution:-

$D = 5^\circ$

$R = 5729.58/D$

$R = \frac{5729.58}{5^\circ} = 1145.92 \text{ ft}$

Tangent length = $BT_1 = BT_2$

$= R \tan \phi/2$

$= 1145.91 \times \tan\left(\frac{14^\circ 13' 23''}{2}\right)$

$BT_1 = BT_2 = 142.96 \text{ ft}$

Length of curve

$L = \frac{\pi R \phi}{180}$

$L = \frac{(3.14)(1145.91)(14^\circ 13' 23'')}{180}$

$L = 284.44 \text{ ft}$

Chainage of Intersection point

= 7966 ft

minus tangent length = -142.96 ft

Chainage of T_1 = 7823.04 ft

plus L = 284.45 ft

Length of chord = $l = 2R\sin\left(\frac{\Delta}{2}\right)$

$= 2 \times 1145.96 \times \sin\left(\frac{14°13'23''}{2}\right)$

$l = 283.72\ ft$

Mid ordinade:-

$= R\left(1 - \cos\left(\frac{\Delta}{2}\right)\right)$

$= 1145.96\left(1 - \cos\left(\frac{14°13'23''}{2}\right)\right)$

$= 8.81\ ft$

External distance:-

$= R\left(\sec\left(\frac{\Delta}{2}\right) - 1\right)$

$= 1145.96\left(\sec\left(\frac{14°13'23''}{2}\right) - 1\right)$

$= 8.88\ ft$

Question # 01 (b)

offset No	offset	Simpson multiplier	Product
1	7.426	1	7.426
2	10.426	4	41.704
3	11.426	2	22.852
4	5.426	4	21.704
5	3.426	2	6.852
6	4.426	1	4.426
			$\Sigma = 104.964$

Area $(h_1 - h_6)$

$= b/3 \times 104.964$

$= 30/3 \times 104.964$

$= 1049.64 m^2$

Question # 02

Given data:-

Circular radius $= 7966 - 7150$

$= 816 m$

Deflection angle $= 20^\circ 40'$

Point of Intersection $= 7966 - 500$

$= 2966 m$

Interval $= 20m.$

Solution:-

$R = 816 \times 2 = 1632m.$

$BT_1 = BT_2 = R \tan \frac{\Delta}{2}$

$BT_1 = BT_2 = 1632 \tan \frac{20^\circ 40'}{2}$

$= 297.56 m$

Length of curve

$$L = \frac{\pi R \Phi}{180}$$

$$L = \frac{3.14 \times 1632 \times 20^\circ 40'}{180}$$

$$L = 588.36 \text{ m}$$

Chainage of point of Intersection:

= 2966m.

minus tangent = -297.56m

Chainge of T_1 = 2668.44

plus L = 588.36

Chainage of T_2 = 3256.8m

Length of 1st Chord = C_1

= 328.44m

$C_2 = C_3 = C_4 = C_5 = C_6 = C_7 = C_8 = C_9 = C_{10} = 20m$

$C_{11} = 3256.8 - 2510 = 746.8$

By deflection method:-

$$\delta_1 = \frac{1718.9 \times C_1}{60R} \text{ (deflec)}$$

$$\delta_1 = \frac{1718.9 \times 328.44}{60(1632)}$$

$$\delta_1 = 5^\circ 45' 55.72''$$

$$\delta_2 = \frac{1718.9 \times 20}{60(1632)}$$

$$\delta_2 = 0°21'3.9''$$

$$\delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = \delta_8 = \delta_9 = \delta_{10}$$

$$\delta_{10} = \frac{1718.9 \times 328.42}{60(1632)}$$

$$\delta_{10} = 5°45'54.45''$$

Total deflection (tangential) angle for the chord is.

$\Delta_1 = \delta_1 = 5°45'55.22''$

$\Delta_2 = \Delta_1 + \delta_2 = 6°6'59.62''$

$\Delta_3 = 6°28'3.52''$

$\Delta_4 = 6°49'7.42''$

$\Delta_5 = 7°10'11.32''$

$\Delta_6 = 7°31'15.22''$

$\Delta_7 = 7°52'19.12''$

$\Delta_8 = 8°13'23.02''$

$\Delta_9 = 8°34'26.92''$

$\Delta_{10} = \Delta_9 + \delta_{10} = 8°34'26.92'' + 5°45'54.45''$

$\Delta_{10} = 14°20'21.37''$

$\Delta_{11} = \Delta_{10} + \delta_{11} = 20°6'15.82''$

$\text{Check} = \frac{20°40'}{2} = 10°21'$

Question # 03

Given data:

$\triangle AKM = 130^\circ$

$\triangle KMC = 140^\circ$

1st arc radius = (7966 - 300) = 7666m

2nd arc radius = (7966 - 200) = 7766m

Chainage of Intersection = (7966 - 400) = 7566m

Solution:

$\alpha = 180^\circ - 130^\circ = 50^\circ$

$\beta = 180^\circ - 140^\circ = 40^\circ$

$\phi = \alpha + \beta = 90^\circ$

$I = 180 - \phi = 180^\circ - 90^\circ = 90^\circ$

$KT_1 = KM = R_1 \tan(\alpha/2)$

$= 7666 \tan \frac{50^\circ}{2}$

$= 3574.71 m$

$KT_2 = MT_2 = R_2 \tan(\beta/2)$

$= 7766 \tan \frac{40^\circ}{2}$

$= 2826.59 m$

$KM = MT_2 + KT_1 = 3574.71 + 2826.59$

$= 6401.30 m$

Now,

$$\frac{BIC}{MIC \sin\beta} = \frac{1}{\sin I}$$

$$BIC = \frac{MIC \sin\beta}{\sin I}$$

$$BIC = \frac{6401.30 \times \sin 40^\circ}{\sin 90^\circ} = 4114.67\ m.$$

$$BM = \frac{6401.30 \times \sin 50^\circ}{\sin 90^\circ} = 4903.68\ m$$

$T_L = IC\bar{I}_1 + BK = 3574.71 + 4114.67 = 7689.38m$

$T_S = M\bar{I}_2 + BM = 2826.59 + 4903.68 = 7730.27m$

$$L_L = \frac{\pi R_L \alpha}{180} = \frac{3.14 \times 7666 \times 50}{180} = 6686.45m$$

$$L_S = \frac{\pi R_S B}{180} = \frac{3.14 \times 7766 \times 40}{180} = 5418.94m$$

Chainage of Intersection point

$= 7566m$

$-T_L = -7689.38m$

Chainage of $\bar{T}_1 = -122.95m$

Plus $L_1 = +6686.45m$

$= 6563.5$

Chainage of compound curvature.

Plus $L_S = 5418.94m$

Chainage of $\bar{T}_2 = 1140.34m.$