Q2) (A) Given data :-

⇒ Two Tangents meet at a Chainage of 7926 ft

⇒ Deflection Angle = 14° 13" 23"

⇒ Degree of Curve = 5°.

To find :-

1) Chainage at the begining of And end of the Curve.

2) length of long chord.

3) Mid ordinate And External Distance.

Solution :-

(A) $D = 5°$

$R = 5729.58 / D = 1145.9171$

Tangent length $= BT_1 = BT_2$

⇒ $R \tan \frac{\Delta}{2}$ ⇒ $1145.9171 \times \tan\left(\frac{14° 13' 23"}{2}\right)$

⇒ $BT_1 = BT_2 = 142.96$ ft.

Length of Curve. $= L = \frac{\pi R \Phi}{180}$

⇒ $\frac{3.14 \times 1145.9171 \times (14°13'23")}{180°}$

$L = 284.45$ ft.

⇒ Chainage of Intersection point = 7926 ft.

Minus Tangent Length = −142.96

plus Length of Curve = 284.45.

Chainage of T_2 = 8067.49 ft.

Length of chord $= l = 2R \sin(\frac{\Phi}{2})$

⇒ $2 \times 1145.91 \times \sin(\frac{14°13'23"}{2})$

$= 283.72$ ft

⇒ Mid Co-ordinate.

$R(1 - \cos(\frac{\Phi}{2})) \Rightarrow 1145.91(1 - \cos(\frac{14°13'23"}{2}))$

$= 8.81$ ft.

⇒ External Distance.

$$R\left(\sec\left(\frac{\Theta}{2}\right)-1\right) \Rightarrow 1145.91\left(\sec\left(\frac{14°13'23''}{2}\right)-1\right)$$

$$= 8.887\,ft$$

(Q No 1) (B) :-

offsect No	offset	Simpson Multiplier	product
1	7.926	1	7.926
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

$\Sigma = 105.464$

$$\text{Area}(h_1 - h_6) = \frac{b}{3} \times 105.464$$

$$= \frac{30}{3} \times 105.464$$

$$= 1054.4\ m^2$$

Q.NO2)

Given Data.

Circular Radius = 7926 - 200
= 7726 m.

Deflection Angle = 20° 40'

point of Intersection = 7926 - 400
= 7526 m.

Interval = 20 m.

Sol:

$\Rightarrow R = 7726 \times 2 = 15452$ m.

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

$BT_1 = BT_2 = 15452 \tan \frac{20° 40'}{2}$

$= 2817.39$ m.

$\Rightarrow$ Length of Curve $= L = \frac{\pi R \Delta}{180}$.

$L = \frac{3.14 \times 15452 \times 20° 40'}{180}$

$L = 5570.7$ m.

⇒ Chainage of point of Intersection.

7526m.

minus Tangent = − 2817.39m

⇒ Chainage of T_1 = 4708.61m

plus L = 5570.7m

⇒ Chainage of T_2 = 13096.7m

Length of first Chord = C_1 =

(Assume) 4722 − 4708.61 = 13.39m

$C_2 = C_3 = C_4 = C_5 = C_6 = C_7 = C_8 = C_9$

$= C_{10} = 20m$

$C_{11} = 13096.7 - 13082 = 14.7m$

By Deflection Method

$\delta_1 = 1718.9 \times C_1 / R$ or $= \frac{1718.9 \times 13.39}{60 \times 1545}$

$\delta_1 = 0°14'55.7606''$.

$$\Rightarrow \delta_2 = 1718.9 \times 20 / 60 \times 1540$$

$$\delta_2 = 0^\circ 2' 13.4924''.$$

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

$$\delta_{11} = \frac{1718.9 \times 14.7}{60 \times 1545 2} =$$

$$\delta_{11} = 0^\circ 1' 38.1148''$$

Total Deflection Angle for the Chord is.

$$\Delta_1 = \delta_1 = 0^\circ 14' 55.7606''$$

$$\Delta_2 = \delta_1 + \delta_2 = 0^\circ 17' 9.253''$$

$$\Delta_3 = 0^\circ 32' 5.0136''$$

$$\Delta_4 = 0^\circ 49' 14.2666''.$$

$$\Delta_5 = 1^\circ 21' 19.2802''$$

$$\Delta_6 = 2^\circ 10' 33.5468''$$

$$\Delta_7 = 3^\circ 31' 52.827''$$

$$\Delta_8 = 5^\circ 42' 26.3738''$$

$\Delta_9 = 9°14'19.2008''$

$\Delta_{10} = \Delta_9 + \delta_{10} = 9°14'19.2008''$
$+ 0°1'38.1148''$

$\Delta_{10} = 9°15'57.3156''$.

$\Delta_{11} = \Delta_{10} + \delta_{11} = 9°15'57.3156''$
$+ 0°1'38.1148''$

$\Delta_{11} = 9°17'35.4304''$

QNO3) **Given Data**

$\Delta AKM = 130°$

$\Delta KMC = 140°$

1st arc radius $= (7926 - 300) = 7626m$

2nd arc radius $= (7926 - 200) = 7726m$

Chainage of Intersection $= (7926 - 400)$
$= 7526m.$

Solution :-

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

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

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

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

$KT_1 = KN = R_1 \tan\frac{\alpha}{2} = 7726 \tan\frac{50}{2}$

$= 3554.062\text{m}$

$KT_2 = MT_2 = R_2 \tan\frac{\beta}{2} = 7726 \tan\frac{40^\circ}{2}$

$= 2836.05\text{m}$

$KM = MT_2 + KT_1 = 2836.05 + 3540.20$

$= 6376.25\text{m}$

$L_L = \frac{\pi R \alpha}{180} = \frac{\pi \times 7726 \times 80}{180}$

Now $\frac{BK}{MK \sin\beta} = \frac{1}{\sin I} \Rightarrow BK = \frac{MK \sin\beta}{\sin I}$

$BK = \frac{6376.25 \sin 40}{\sin 90^\circ} = 4098.57\text{m}$

$BM = MK \sin\alpha / \sin I = \frac{6376.25 \sin 56}{\sin 90^\circ}$

$= 4884.49m$

$T_L = KT_1 + BK = 3540.20 + 4098.57.$

$= 7638.77.m.$

$T_S = MT_2 + BM = 2836.05 + 4884.49$

$= 7720.54m$

$L_L = \frac{\pi R_L \alpha}{180} = \frac{3.14 \times 7626 \times 50}{180} = 6651.5$

$L_S = \pi R_S 13/180 = \frac{3.14 \times 7726 \times 40}{180.} = 5391.031$

change of intersection point

$-T_L = -\overset{7526}{7638.77}m.$

chainage of $T_1 = -112$

plus $L_L = 6651.5m$

(10)

Chainage of Compound Curvature

plus L_S = 6539.5

Chainage of T_2 = 11930.531.