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Subject : Survey II

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Q #01 (A)

Solution :-

Tangent Meet at chainage = 7373 ft

Deflection Angle =  $14^{\circ} 13' 23''$

Degree of curve =  $5^{\circ}$

Now

$$D = 5^{\circ}$$

$$R = 5729.58/D$$

$$R = 5729.58/5^{\circ}$$

$$R = 1145.91 \text{ ft}$$

(A) Tangent Length =  $T_1 = T_2 = R \tan(\phi/2)$

$$= T_1 = T_2 = 1145.91 \times \left( \frac{14^{\circ} 13' 23''}{2} \right)$$
$$= 142.96 \text{ ft}$$

(B) Length of curvature

$$L = \pi R \phi / 180$$

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

$$L = 284.45 \text{ ft}$$

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$$\text{Chainage of intersection point} = 7373 \text{ ft}$$

$$\text{Minus tangent Length} = -142.96 \text{ ft}$$

$$\begin{aligned} \text{Chainage of } T_1 &= 7373 - 142.96 \\ &= \boxed{7230.04 \text{ ft}} \end{aligned}$$

$$\begin{aligned} \text{Chainage of } T_2 &= 7230.04 + 284.45 \\ &= \boxed{7514.49 \text{ ft}} \end{aligned}$$

$$\text{Length of chord} = L =$$

$$= 2R \sin(\phi/2)$$

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

$$= \boxed{283.72 \text{ ft}}$$

$$\text{Mid ordinate} =$$

$$= R (1 - \cos(\phi/2))$$

$$= 1145.91 \times \left(1 - \cos\left(\frac{14^\circ 13' 23''}{2}\right)\right)$$

$$= \boxed{8.81 \text{ ft}}$$

$$\text{external distance } e.$$

$$= R (\sec(\phi/2) - 1)$$

$$= 1145.91 \times (\sec(14^\circ 13' 23''/2) - 1) = \boxed{8.88 \text{ ft}}$$

Q#102

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Given Data:-

$$\text{Circular Radius} = 7373 - 7250 \\ = 123 \text{ m}$$

$$\text{Deflection Angle} = 20^{\circ} 40'$$

$$\text{Point of intersection} = 7373 - 5000 \\ = 2373$$

$$\text{Interval} = 20 \text{ m}$$

Solution :-

$$R = 123 \times 2 = \boxed{246 \text{ m}}$$

$$Bt_1 = Bt_2 = R \tan(\phi/2)$$

$$Bt_1 = Bt_2 = 246 \times \tan(20^{\circ} 40'/2)$$

$$Bt_1 = Bt_2 = \boxed{44.85 \text{ m}}$$

Length of curve

$$L = \pi R \phi / 180$$

$$L = \frac{3.14 \times 246 \times 20^{\circ} 40'}{180}$$

$$L = \boxed{88.68 \text{ m}}$$

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$$\text{Chainage of point of intersection} = 2373 \text{ m}$$

$$\text{Minus tangent} = -44.85 \text{ m}$$

$$\text{Chainage of } T_1 = 2373 - 44.85 = 2328.15 \text{ m}$$

$$L = 88.68 \text{ m}$$

$$\text{Chainage of } T_2 = 2328.15 + 88.68 = 2416.83 \text{ m}$$

Length of 1st chord  $C_1$

$$C_1 = 2345 - 2328.15$$

$$C_1 = 16.85 \text{ m}$$

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

$$C_{11} = 2416.83 - 2398.43$$

$$C_{11} = 18.4 \text{ m}$$

By Deflection Method

$$\phi_1 = \frac{1718.8 \times C_1}{60R}$$

$$\phi_1 = \frac{1718.8 \times 16.85}{60(246)} = 1^\circ 57' 44.26''$$

$$\delta_2 = \frac{1718.9 \times 20}{60(246)}$$

$$\delta_2 = 2^\circ 19' 44.88''$$

$$\delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \dots = \delta_{10}$$

$$\delta_{11} = \frac{1718.9 \times 18.4}{60(246)}$$

$$\delta_{11} = 2^\circ 8' 34.09''$$

Total Deflection (tangent) Angle for the chord is

$$\Delta_1 = \delta_1 = 1^\circ 57' 44.26''$$

$$\Delta_2 = \delta_1 + \delta_2 = \cancel{2^\circ 11' 48.52''} = 2^\circ 6' 18.35''$$

$$\Delta_3 = \delta_1 + \delta_2 + \delta_3 = \cancel{3^\circ 19' 02.78''} = 3^\circ 26' 3.23''$$

$$\Delta_4 = \cancel{4^\circ 31' 16.99''} = 4^\circ 12' 5.23''$$

$$\Delta_5 = \cancel{5^\circ 43' 32.37''} = 5^\circ 11' 12.3''$$

$$\Delta_6 = \cancel{6^\circ 55' 46.63''} = 5^\circ 51' 52.3''$$

$$\Delta_{11} = 10^\circ 56' 50.17''$$

$$\Delta_7 = 6^\circ 51' 15.12''$$

$$\Delta_8 = 7^\circ 12' 13.2''$$

$$\Delta_9 = 8^\circ 9' 9.2''$$

$$\Delta_{10} = 9^\circ 12' 10.3''$$

check  $\frac{\phi}{2} = \frac{20^\circ 40'}{2}$   
 $= 10^\circ 21'$

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Q NO #03

Given Data:-

$$\Delta AKM = 130^\circ, \quad \Delta KMC = 140^\circ$$

$$\text{1st Arc Radius} = (7373 - 300) = 7073 \text{ m}$$

$$\text{2nd Arc Radius} = (7373 - 200) = 7173 \text{ m}$$

$$\text{Chainage of intersection point} = (7373 - 400) = 6973 \text{ m}$$

Required :

Tangent points = ?

Compound Curvature = ?

Solution :

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

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

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

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

$$\begin{aligned}KT_1 = KN &= R_L \tan(\alpha/2) \\ &= 7073 \tan(50^\circ/2) \\ &= \boxed{3298.19}\end{aligned}$$

$$\begin{aligned}MN = MT_2 &= R_s \tan(\beta/2) \\ &= 7173 \tan(40^\circ/2) = \boxed{2610.75}\end{aligned}$$



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$$KM = MT_2 + KT_1 = 3298.19 + 2616.75$$

$$= \boxed{5908.94 \text{ m}}$$

Now

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

$$BK = \frac{MK \sin \beta}{\sin I} = \frac{5908.94 \times \sin(40^\circ)}{\sin 90^\circ}$$

$$= \boxed{3798.19}$$

$$BM = \frac{MK \sin \alpha}{\sin I} = \frac{5908.94 \times \sin(50^\circ)}{\sin 90^\circ}$$

$$= \boxed{4526.51}$$

$$TL = KT_1 + BK = ~~3298.19~~ 3298.19 + 3798.19 = 7096.38 \text{ m}$$

$$Ts = MT_2 + BM = 2616.75 + 4526.51 = 7137.26 \text{ m}$$

$$L_L = \frac{\pi R_L \alpha}{180} = \frac{3.14 \times 7073 \times 50}{180} = \boxed{6169.22 \text{ m}}$$

$$L_S = \frac{\pi R_S \beta}{180} = \frac{3.14 \times 7173 \times 40}{180} = \boxed{5005.16 \text{ m}}$$



Chainage of intersection point = 6973m

Intersection point - TL = ~~6973~~ - 7096.38m

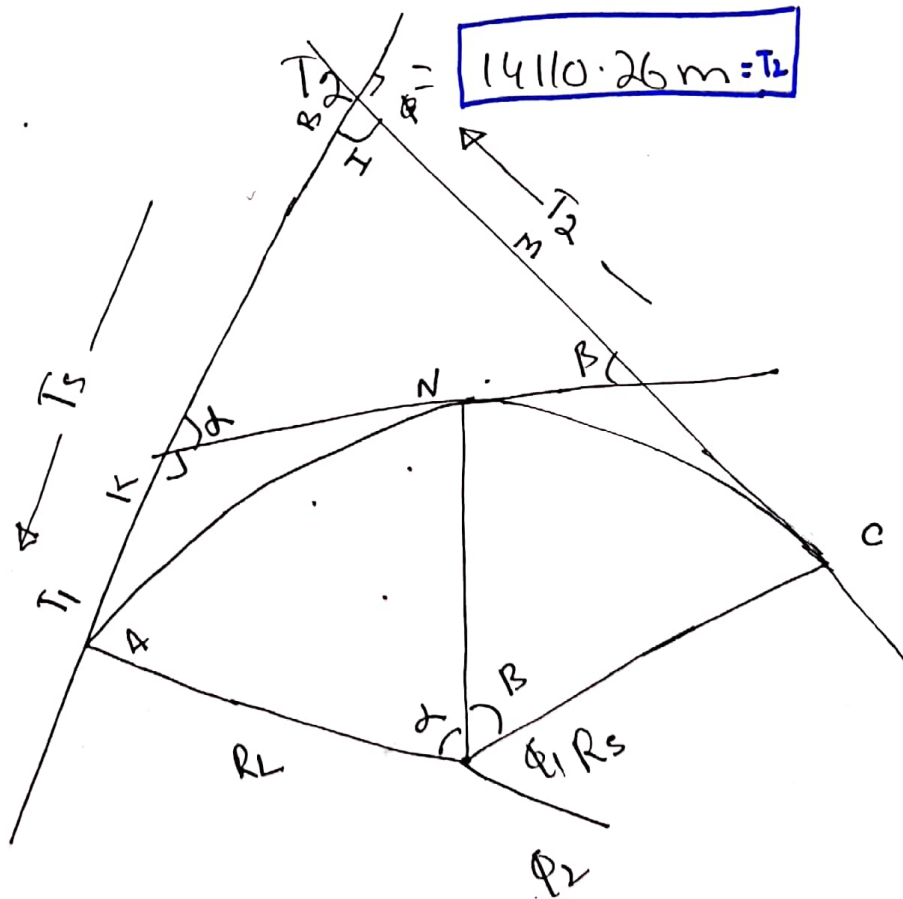
Chainage of  $t_1 = -7096.38 + 6973 = -123.38m$

LL +  $t_1 = 6169.22 - 123.38 = 6045.84m$

Chainage of Compound Curvature

$L_s = 5005.16m$

Chainage of  $T_2 = 6973 + 7137.26$



Q No# 01 (B)

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Offset No	offset	Simpson Multiplier	Product
1	7.547	1	7.547
2	10.547	4	42.188
3	11.547	2	23.094
4	5.547	4	22.188
5	3.547	2	7.094
6	4.547	1	4.547

$$\Sigma = 106.658$$

Area ( $h_1 - h_6$ )

$$= b/3 * 106.658$$

$$= \frac{30}{3} * 106.658$$

$$\text{Area} = 1066.58 \text{ m}$$