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ID

7982

Section

B

Dept

Civil

Subject

Engineering Survey  
II

Question No 1 (Part a) :

Given :

=> Tangent meet at chainage = 7982

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

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

Solutions

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

$$R = \frac{5729}{D} = 1145.97$$

$$\text{Tangent Length} = BT_1 = BT_2 = R \tan\left(\frac{\Delta}{2}\right)$$

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

$$BT_1 = BT_2 = 142.96$$

Page #02

$$\begin{aligned} \text{Length of Curve } L &= \frac{\pi R \Delta}{180} \\ &= \frac{\pi \times 145.91 \times 14^\circ 13' 23''}{180} \end{aligned}$$

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

Chainage of intersection point = 7982  
Minus tangent length = -142.96 ft

$$\text{Chainage of } T_1 = 7839.04$$

$$\text{Plus } L = 284.4 \text{ ft}$$

$$\text{Chainage of } T_2 = 8123.44 \text{ ft}$$

$$\text{Length of chord} = 2R \sin \frac{\Delta}{2}$$

$$= 2(145.91) \sin \frac{14^\circ 13' 23''}{2}$$

$$= 281.54$$

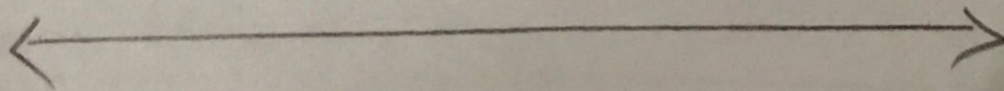
Page # 03

Mid ordinate :

$$\begin{aligned} &= R - \left( 1 - \cos \frac{\phi}{2} \right) \\ &= 1145.91 \left( 1 - \cos \frac{(14^\circ 13' 23'')}{2} \right) \\ &= 8.81 \text{ ft} \end{aligned}$$

External Distance :

$$\begin{aligned} &= R \left( \sec \left( \frac{\phi}{2} \right) - 1 \right) \\ &= 1145.91 \left( \sec \frac{(14^\circ 13' 23'')}{2} - 1 \right) \\ &= 8.88 \text{ ft} \end{aligned}$$



(Question 1 Part B)

Solution :

offset No	offset	Simpson Multiplier	Product
1	7.982	1	7.982
2	10.982	4	43.928
3	11.982	2	23.964
4	5.982	4	23.928
5	3.982	2	7.964
6	4.982	1	4.982

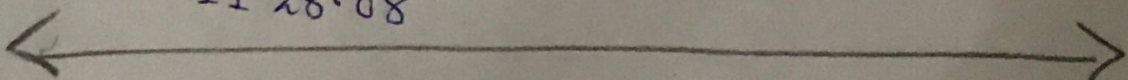
$$\Sigma = 112.802$$

Area (  $h_1 - h_6$  )

$$= \frac{b}{3} \times 112.802$$

$$= \frac{30}{3} \times 112.802$$

$$= 1128.08$$



Page # 05

Question NO 2 :

Given :

$$\text{Circular radius} = 7982 - 7700 = 282$$

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

$$\begin{aligned} \text{Point of intersection} &= 7982 - 5000 \\ &= 2982 \end{aligned}$$

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

Solution :

$$R = 282 \times 2 \Rightarrow 564$$

$$\begin{aligned} BT_1 &= BT_2 = R \tan \frac{\phi}{2} \\ &= 564 \tan \left( \frac{20^{\circ} 40'}{2} \right) \end{aligned}$$

$$= 106.37$$

Page #06

Length of curve:

$$L = \frac{\pi R \phi}{180}$$
$$= \frac{\pi \times 564 \times (2040')}{180}$$
$$= 203.26 \text{ m}$$

Chainage of intersection = 2982 m

Minus Tangent = 106.37

Chainage  $T_1$  = 2875.63

Plus  $L$  = + 203.26

Chainage of  $T_2$  = 3078.89 m

Length of 1st chord =  $C_1$  =

$$= 2895 - 2875.63$$

$$= 19.37$$

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

$$C_{10} = 3078.89 - 3060$$

$$C_{10} = 18.89 \text{ m}$$

Page #07

By Deflection Method :

$$\delta_1 = \frac{1718.9 \times C_1}{60(564)}$$

$$= 0^\circ 59' 2.03''$$

$$\delta_2 = \frac{1718.9 \times 20}{60(564)}$$

$$= 1^\circ 0' 57.23''$$

$$\delta_2 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = \delta_8 = \delta_9 =$$

$$\delta_{10} = \frac{1718.9 \times 18.89}{60(564)}$$

$$= 0^\circ 57' 34.26''$$



Page #08

Total deflection (target tail) angle for chord is

$$\Delta_1 = \int_1 = 0^\circ 59' 2.03''$$

$$\Delta_2 = \int_1 + \int_2 = 0^\circ 59' 2.03'' + 1^\circ 0' 57.23''$$

$$\Delta_2 = 1^\circ 59' 59.26''$$

$$\Delta_3 = 3^\circ 0' 56.49''$$

$$\Delta_4 = 4^\circ 1' 53.72''$$

$$\Delta_5 = 5^\circ 2' 50.95''$$

$$\Delta_6 = 6^\circ 3' 48.27''$$

$$\Delta_7 = 7^\circ 4' 45.5''$$

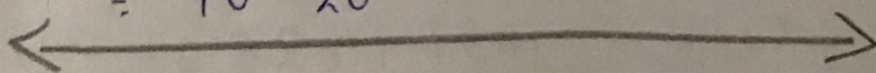
$$\Delta_8 = 8^\circ 5' 42.73''$$

$$\Delta_9 = 9^\circ 6' 39.96''$$

$$\Delta_{10} = 10^\circ 4' 14.22''$$

$$\text{Checked} = \frac{20^\circ 410'}{2}$$

$$= 10^\circ 20'$$



Page No 4

Question No 3

**Given:**  $\Delta AKM = 130^\circ$

$\Delta KMC = 140^\circ$

1st arc radius =  $7982 - 300 = 7682\text{m}$

2nd arc radius =  $7982 - 200 = 7782\text{m}$

Chainage of intersection =  $7982 - 400 = 7582\text{m}$

**Solution:**

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

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

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

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

$$I = 90^\circ$$

$$kT_1 = k.N = R_1 \tan\left(\frac{\alpha}{2}\right)$$

$$= 7682 \tan\left(\frac{50^\circ}{2}\right)$$

$$= 3562$$

$$kT_2 = MT_2 = R_2 \tan\left(\frac{\beta}{2}\right)$$

$$= 7782 \tan\left(\frac{40^\circ}{2}\right)$$

$$= 3264.93\text{m}$$

Page #10

$$KM = MT_2 + kT_1 = 3562 + 3264 \cdot 13$$
$$= 6826 \text{ m}$$

Now

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

$$Bk = \frac{MK \sin \beta}{\sin I}$$

$$Bk = \frac{(6826) \sin(40)}{\sin(90^\circ)}$$

$$= \frac{4387.66}{\sin(90^\circ)}$$

$$= 4387.66 \text{ m}$$

$$BM = \frac{6826 \sin(50^\circ)}{\sin 90^\circ}$$

$$= 5229.01 \text{ m}$$

$$T_c = kT_1 + Bk = 3562 + 4387.66$$
$$= 7949.66 \text{ m}$$

Page 11

$$T_s = MT_2 + BM = 32641.93 + 5229.01 \\ = 8493.94$$

$$L_2 = \frac{\pi R_2 \alpha}{180} \\ = \frac{\pi \times 3562 \times 50^\circ}{180} = 3108.43$$

$$L_s = \frac{\pi R_s B}{180} \\ = \frac{\pi \times 7782 \times 40^\circ}{180} = 5432.86$$

Chainage of intersection point  
= 7782

$$-T_2 = -7949.66 \text{ m}$$

Chainage of  $T_2 = -367$

$$\text{Plus } L_2 = 3108 \text{ m} \\ = 2741$$

Page = 12



Change of compound = Curvature

$$Plw Ls = +5432$$

$$\text{Change of } T_L = 8173.86 \text{ m}$$

