Subject = Advanced Engineering Survey

ID = 7889

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Section = A

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PAPER solved thanks.

Question No 2
part (a)

Q:- Two tangents meet at a chainage of (1.D)ft with the deflection angle of 14° 13' 23". Degree of Curve is 5°.

1. Chainage at the begining and end of the Curve
2. Length of long chord.
3. Mid ordinate and external distance.

ANS:-

Given data.

solution:- I.D 7889

Degree of Curve = 5°

Angel of deflection = 14° 13' 23"

$$R = \frac{5729.58}{5} = 1145.916 \text{ ft}$$

=) We known that

tangent length = $BT_1, T_2 = R \tan(\Delta/2)$

$$Bt_1 = Bt_2 = 1145.91 \times \tan\left(\frac{14°13'23''}{2}\right)$$

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

Length of the Curve:-

$$L = \frac{\pi R \Delta}{180^\circ}$$

$$L = 284.45 ft$$

Chainage of Intersection point = 7889 ft

(-) tangent length = -142.96

Chainage of t_1 = 7746.4

(+) Chainage length = 284.45

Chainage of t_2 = 8173.45

length of chord = I

$\Rightarrow$ $2p \sin(\Delta/2)$

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

$= 283.72 ft$

Mid ordinate:- $R\left(1 - \cos(\Delta/2)\right)$

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

$= 8.81 ft$.

External distance

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

$1145.11\left(\sec\left(\frac{14^\circ 13' 23''}{2}\right) - 1\right)$

$8.89 ft$.

Question No 1
Part b.

$$ID = 7.889 - 7.889 = 0$$

Chainage meter	0	30	60	90	120	150
Offset meter	7.889	7.889+3 10.889	7.889+4 11.889	7.889-2 5.889	7.889-4 3.889	7.889-3 4.889

As we know that from the above given table

that $b = 30\ m$

so we can find area then

$$b/3\left(7.889+3.889\right)+2(11.889)+4(10.889)+4(5.889)+\left(\frac{3.889+4.889}{2}\right)\times b$$

$$\Sigma = 107.057$$

$b=30$

Also we know that

$$\text{Area} = (h_1 - hb)$$

$$\Rightarrow b/3 \times 107.057$$

$$\Rightarrow \frac{30}{3} \times 107.057$$

$$\Rightarrow (1070.5\ m^2)$$

Question No 2

As we assume that radius so become

$7889 - 7000 = 889\ m$

$R = 889\ m$

deflection angle $= 20°40'$

Chainage at point of Intersection which we also assume =

$7889 - 4000 = 3889$

Chainage = 3889

Peg Interval = 20 m

So we can find tangent length

$$BT_1 = BT_2 = R\tan\left(\frac{20°40'}{2}\right)$$

$$T_2 = BT_1 = BT_2 = 162.093$$

So Know

L or length of Curve =

$$L = \frac{\pi R \theta}{180°}$$

$$L = \frac{6.14 \times 889 \times 20°40'}{180°}$$

$$L = 386.712$$

Now Chainage

$T_1 = 3889 - 162.093$

$T_1 = 3889 - 162.093$

$T_1 = 3726.07$

Chainage at $T_2 = 3726.07 + 626.712$

$T_2 = 4352.782$

Now we can find length of 1st sub chord

$= 3767 - 3726.07$

$C_1 = 40.93\ m$

Now for last chord curve

$C_{15} = 4352.782 - 4318$

$C_{15} = 34.782\ m$

So we know that

$C_1 = C_2 = C_3 = C_4 = C_5 = C_6 = C_7 = C_8 = C_9 = C_{10} = C_{11} = C_{12} = C_{13}$

$C_4 = 20\ m$

Now we can find number of chord

$$\text{Number of chord} = \frac{\text{length of Curve} - C_1}{20}$$

$$\text{Number of chord} = \frac{626.712 - 40.93}{20}$$

chord = 29.28

Now deflection angle

$$b_1 = \frac{1718.9 \times C1}{60R}$$

$$b_1 = \frac{1718 \times 40.93}{60 \times 889}$$

$$\boxed{b_1 = 1^\circ 3' 189''}$$

$$b_2 = \frac{1718.9 \times 20}{60 \times 889}$$

$$\boxed{b_2 = 0^\circ 6' 44''}$$

So $b_2 = b_3 = b_4 = b_5 = b_6 = b_7 = b_8 = b_9 = b_{10} = b_{11}$

$= b_{12} = b_{13} = b_{14}$

$$b_{14} = \frac{1718.9 \times 27.43}{60 \times 889}$$

$b_{14} = 0^\circ 8' 700''$

Now total deflection tangential angle for the chord are:

$D_1 = b_1 = 1^\circ 3' 189''$

$D_2 = b_1 + b_2 = D_1 + b_2 = 3^\circ 9' 24''$

$D_3 = D_2 + b_3 = 2^\circ 20' 45''.38$

$D_4 = D_3 + b_4 = 2^\circ 58' 42.0''7$

$\Delta 5 = 4^\circ 48' 50.21''$

$\Delta 6 = 5^\circ 50' 13.57''$

$\Delta 7 = 6^\circ 51' 36.93''$

$\Delta 8 = 7^\circ 52' 0.30''$

$\Delta 9 = 8^\circ 54' 23.65''$

$\Delta 10 = 9^\circ 51' 44.01''$

$\Delta 11 = 10^\circ 56' 10.34''$

$\Delta 1$

$$\text{Check} = \frac{\Delta}{2} = \frac{20^\circ 40'}{2}$$

$$\Delta t = 10^\circ 20''$$

(7)

Question:- 03

Ans:-

Given data

$ID = 7889$

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

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

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

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

As we know that

$$KT_1 = KN = R_s\left(\tan\left(\frac{\alpha}{2}\right)\right) \rightarrow (i)$$

first arc is given $ID - 300$

$\rightarrow 7889 - 300 =$ **Rs 7589 m**

$$KN = R_s \tan\left(\frac{\alpha}{2}\right) = 7589 \tan\left(\frac{50^\circ}{2}\right)$$

$$KT_1 = KN = 3538.750 \text{ m}$$

$$MT_2 = m_n = R_L \tan\left(\frac{\beta}{2}\right) \rightarrow (ii)$$

2nd arc is given $ID - 200$

$(7889 - 200)m =$ **R_L 7689 m**

put in above eq (ii)

$$m_n = 7689 \left(\tan\frac{40}{20}\right)$$

$$MT_2 = M_n = \text{2798.02 m}$$

$MT_2 = KN + MN = 2798.02 + 3538.750$

$Km = \boxed{6336.77\ m}$

Find $\triangle BKm$, by Sin rule

$$\frac{BK}{\sin B} = \frac{KM}{\sin(J)}$$

$$BK = \frac{Km \sin B}{\sin(J)}$$

Putting value

$$BK = \frac{6336.77 \times \sin 40^\circ}{\sin 90^\circ}$$

$$\boxed{BK = 4073.197}$$

$$BM = \frac{Km \times \sin\alpha}{\sin(J)}$$

Putting value

$$BM = \frac{6336.77 \times \sin 50^\circ}{\sin 90^\circ}$$

$$\boxed{BM = 4854.247}$$

$TL = KT1 + BK =$

Put value

$TL = 3538.750 + 4073.197$

$$\boxed{TL = 7611.947}$$

$Ts = MT_2 + BM$

Putting value

$Ts = 2798.02 + 4854.247$

$$\boxed{Ts = 7652.267}$$

$$L_S = \frac{\pi R S \alpha}{180^\circ}$$

Putting value

$$\frac{\frac{22}{7} \times 7589 \times 50^\circ}{180^\circ}$$

$$\boxed{L_S = 6625.317\ m}$$

$$L_L = \frac{\pi R L \beta}{180^\circ}$$

Putting value

$$L_L = \frac{\frac{22}{7} \times 7689 \times 40}{180^\circ}$$

$$\boxed{L_L = 5370.95\ m}$$

Chainage of Intersection.

point = 7889 - 400

$T_L \Rightarrow \boxed{7489\ m}$

Chainage of Intersection point - TL

$T_1 = 7489 - 7611.947$

$T_1 = -122.947$

$(+) \Rightarrow S = -122.947 + 6625.317$

$= \boxed{6502.37m}$

Chainge of Compound Curvature

(N) Plus L_L ——

$T_2 = 6502.37 + 5370.095$

$T_2 = 11872.465\ m$

THE END