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ID- 7978

SEC – B

SUBJECT: Advance Engineering Survey.

Submitted To:

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Q. No (01)

a) Two tangents meet at a chainage of 7978ft(10) with the deflection angle of $14°13'23''$. Degree of curve is $5°$.

Calculate:

1) Chainage at the begining and end of the curve.

2) Length of long cord.

3) Mid ordinate and external distance.

Ans:

Given:

Tangent meet at chainage = 7978ft.

Deflection angle = $14°13'23''$.

Degree of curve = $5°$.

Solution:

$D = 5°$

$R = 5729.58/D = 5729.58/5° = 1145.91$

Tangent length = $BT_1 = BT_2$

$= R \tan\left(\frac{\Phi}{2}\right)$

$BT_1 = BT_2 = 1145.91 \times \tan\left(\frac{14°13'23''}{2}\right)$

$= 145.22 ft.$

Length of curve:

$$L = \frac{\pi R \Phi}{180°}$$

$$L = \frac{\pi \times 1145.96 \times 14°13'32''}{180°}$$

$L = 284.19$ ft.

Chainage of intersection point = 7978.

Minus tangent length = -145.22 ft.

Chinage of T_s = 7832.78 ft

Plus l = 284.19 ft.

Chainage of $T_2 = 7693.81$

Length of chord = I

$$= 2R \sin\left(\frac{\Phi}{2}\right)$$

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

$$= 283.73 \text{ ft.}$$

Mid Ordinate:

$$R\left[1 - \cos\left(\frac{\Phi}{2}\right)\right]$$

$$= 1145.91\left[1 - \cos\left(\frac{14°13'23''}{2}\right)\right]$$

$$= 1145.91\,[0.514]$$

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

External Distance:

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

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

$$= 8.88 \text{ ft.}$$

Part (b)

Find the area from the data obtained from chain survey as shown in the table below, using simpson one third rule. The first offset is your ID (7978) ÷ 10000.

Chainage(m)	0	30	60	90	120	150
offset(m)	7.978	7.978+3	7.978+4	7.978-2	7.978-4	7.978-3

offset No	offset	Simpson multiper	Product
1	7.978	1	7.978
2	10.978	4	43.912
3	11.978	2	23.956
4	5.978	4	23.912
5	3.978	2	7.956
6	4.978	1	4.978

$\Sigma = 112.692$

$$\text{Area} = b/3 \times 112.692$$

$$= 30/3 \times 112.692$$

Total Area $= 1126.92\ m^2$.

Q. No (02)

A circular curve of radius (1D-200)m deflecting right through 20°40' is to be act out b/w two sights having chainage of the point of intersection as (1D-400)m.

Calculate all the data necessary for setting out the curve using deflection angle method. with Peg interval being 20m.

Solution:

Given data:

Circular radius = 7978 - 7694 = 284m

Deflection Angles = 20'40'

point of intersection = 7978-5000 = 2978

Interval = 20m

Solution:

$$R = 284 \times 2$$
$$= 568m$$

$$BT_1 = BT_2 = R\tan\left(\frac{\Phi}{2}\right)$$

$$= 568\tan\left(\frac{20°40'}{2}\right)$$

$$\boxed{BT_1 = BT_2 = 103.56m}$$

Length of curve:

$$L = \frac{\pi R \Phi}{180°}$$

$$L = \frac{\pi \times 204.87 \times 20°40'}{180}$$

$$\boxed{L = 204.87m}$$

Change of point of intersection

= 2978

Minus tangent = -103.56

Change of I_1 = 2874.44

Plus l = 204.87

Change of T_2 = 3079.31

Length of 1st cord

$C_1 = 2855 - 2874.44$

$C_1 = 19.44$

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

$C_{10} = 3079.31 - 3060$

$= 19.31\ m$

By deflection method

$$\delta_1 = \frac{1718.9 \times C_1}{60 l}$$

$$\delta_1 = \frac{1718.9 \times 19.44}{60(568)}$$

$$\boxed{\delta_1 = 1^\circ 2' 13.16''}$$

$$\delta_2 = \frac{1718.9 \times 19.44}{60(568)}$$

$$\boxed{\delta_2 = 1^\circ 0' 31.48''}$$

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

$$\delta_{10} = \frac{1718.9 \times 19.44}{60(568)}$$

$$\boxed{\delta_{10} = 0^\circ 58' 26.19''}$$

Total deflection (tangential) angle for the chord.

$\Delta_1 = \delta_1 = 1^\circ 2'' 13.16''$

$\Delta_2 = \delta_1 + \delta_2 = 2^\circ 2' 44.64''$

$\Delta_3 = 3^\circ 3'' 16.12''$

$\Delta_4 = 4^\circ 3' 47.6''$

$\Delta_5 = 5^\circ 4' 19.08''$

$\Delta_6 = 6^\circ 4' 50.56''$

$\Delta_7 = 7^\circ 5' 22.04''$

$\Delta_8 = 8^\circ 5' 53.52''$

$\Delta_9 = 9^\circ 6' 25''$

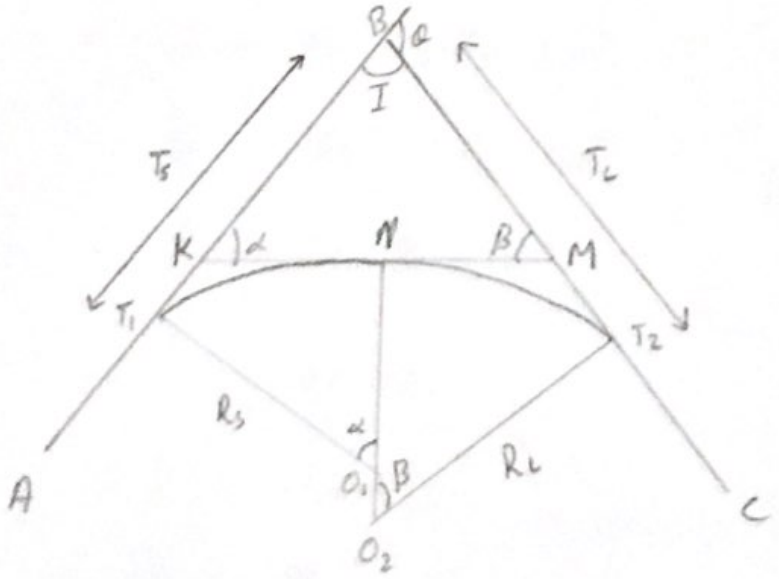
$\Delta_{10} = 10^\circ 6' 56.48''$

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

$= 10^\circ 20'$

Q No(03)

Two tangents AB & BC are intersected by a line KM. The angles AKM & KMC are 130° & 140° respectively. The radius of the first arc is (1D-300)m and 2nd arc is (1D-200)m. Find the chainage of the tangent point of compound curve given that the chainage of intersection point is (1D-400)m.



Given:

$\Delta AKM = 130^\circ$

$\Delta KMC = 140^\circ$

1st arc radius $(7978 - 300) = 7678m$

2nd arc radius $(7978 - 200) = 7778m$

Chainage of intersection point

$(7978 - 400) = 7578m$

Required:

Tangent points = ?

Compound curvature = ?

Solution:

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

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

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

$I = 180^\circ - \phi$

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

$I = 90^\circ.$

$$KT_1 = KN = R_L \tan\left(\frac{\alpha}{2}\right)$$

$$= 7678 \tan\left(\frac{50^\circ}{2}\right)$$

$$\boxed{KT_1 = KN = 3580.31\ m}$$

$$MN = MT_2 = R_S \tan\left(\frac{\alpha}{2}\right)$$

$$= 7778 \tan\left(\frac{40^\circ}{2}\right)$$

$$\boxed{MN = MT_2 = 2830.96\ m}$$

$$KM = MT_2 + KT_1 = 3580.31 + 2830.96$$

$$\boxed{KM = 6411.27\ m}$$

Now,

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

$$BK = \frac{MK \sin\beta}{\sin I} = \frac{6411.27 \times \sin 40^\circ}{\sin 90^\circ}$$

$$\boxed{BK = 4121.08\ m}$$

$$BM = \frac{MK \sin\alpha}{\sin I} = \frac{6411.27 \times \sin 50^\circ}{\sin 90^\circ}$$

$$\boxed{BM = 4911.31\,m}$$

$$T_L = KT_1 + BK = 3580.31 + 4121.31$$

$$\boxed{T_L = 7701.62\,m}$$

$$T_S = MT_2 + BM = 2830.96 + 4911.31$$

$$\boxed{T_S = 97.42.27m}$$

$$L_L = \frac{\pi R_L \alpha}{180} = \frac{\pi (7678) 50^\circ}{180^\circ}$$

$$\boxed{L_L = 6696.92\,m}$$

$$L_S = \frac{\pi R_S \beta}{180} = \frac{\pi (7778) 40^\circ}{180}$$

$$\boxed{L_S = 5427.31m}$$

Chainage of intersection point

= 7578 m

$-T_L$ = - 7701.62 m

Chainage of T_L = -123.62 m

Plus L = +6696.92

= 6573.3 m

Chainage of compound curvature

Plus L_S = 5427.31m.

Chainage of T_S = 12000.61m.