ID 7337

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Mid term

~~B(E~~)

B.(civil)

Advanced Engineering Survey

Q1a

Two tangent meet at a change of 7337 feet with deflection angle of $14°13'23''$. Degree of curve is $5°$

1) Chainage at the beginning & end of Curve
2) Length of long chord
3) Mid ordinate & external distance

Given data :-

$D = 5°$

$R = 5729.58/D$

$\Rightarrow 5729.58/5° = 1145.916\,ft$

Tangent length $= BT_1 = BT_2$

$R\tan(\phi/2)$

$BT_1 = BT_2 = 1145.916 \times \tan\left(\frac{14°13'23''}{2}\right)$

$BT_1 = BT_2 = 142.96\,ft$

Length of Curve

$L = \frac{\pi R \phi}{180}$

$L = \frac{\pi \times 1145.916 \times 14°13'23''}{180}$

$L = 284.45\,ft$

Chainage of intersection

Point = 7337

Minus tangent length = -142.96 ft

Chainage of T_1 = 7194.04 ft

PLus L = 284.45 ft

Chainage of T_2 = 7478.49 ft

Length of chord = l

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

$= 2 \times 1145.916 \times \sin\left(\frac{14^\circ 13' 23''}{2}\right)$

$= 283.72$ ft

Mid ordinat

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

$1145.916\left(1 - \cos\left(\frac{14^\circ 13' 23''}{2}\right)\right)$

$= 8.81$ ft

External Distance

$R\left(\sec\left(\theta/2\right)-1\right)$

$= 1145.916\left(\sec\left(\frac{14^{\circ}12'23''}{2}\right)-1\right)$

$= 8.88$ ft

Q1 B

find the area from the data obtain from Chain survey. as show in table below using simson one third rule
the first offset is I.D ÷ 1000 (7337 ÷ 1000)
for e.g having I.D (7337) first offset will be 7.337 and so on

Given dat

Chainage	0	30	60	90	120	150
offset (m)	7.337	7.337+3	7.337+4	7.337−2	7.337−4	7.337−3
	7.337	10.337	11.337	5.337	3.337	4.337
	a	a_1	a_2	a_3	a_4	a_5

b = 30 , ID = 7337

Solution

$$\text{Area} = \frac{b}{3}\left(a_0 + a_4 + 2a_2 + 4a_1 + 4a_3 + \left(\frac{a_4 + a_5}{2}\right) \times b\right.$$

$$\Rightarrow \frac{30}{3}\left(7.337 + 3.337 + 2(11.337) + 4(10.337 + 4(5.337)\right) + \left(\frac{3.337 + 4.337}{2}\right) \times 30$$

$$\Rightarrow \frac{30}{3}\left(10.674 + 22.674 + 41.348 + 21.348\right. + \frac{7.674}{2} \times 30$$

$$\Rightarrow \frac{30}{3}(96.044) + 3.837 \times 30$$

$$\Rightarrow 10(96.044) + 115.11$$

$$\Rightarrow 960.44 + 115.11$$

$$\Rightarrow \boxed{1075.55} \text{ Area}$$

Q2

An

Given data

Radius $= ID - 200 = 7337 - 200 = 7137$

$\Phi = 20^\circ 40'$

Chainage of $B = ID - 400 = 7337 - 400 = 6937$

Peg intervel $= 20\ m$

Required :

Deflection Angle $= ?$

solution

Tangent length $= BT_1 = BT_2 = R \tan \frac{\Phi}{2}$

$= 7137 \tan \frac{20^\circ 40'}{2} = 1301.30$

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

$L = 3.14 \times 7137 \times \frac{20^\circ 40'}{180} = 2573.1\ m$

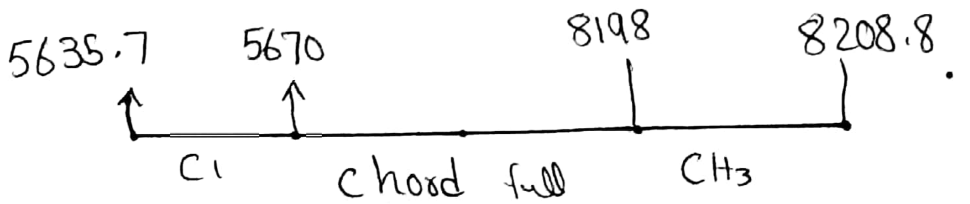
Chainge of T_1 = Chainage of $B - BT_1$

$6937 - 1301.30 = 5635.7\ m$

Chainge of T_2 = Chainage of $T_1 + L$

$5635.7 + 2573.1 = 8208.8\ m$

Chainage of T



$$\delta_1 = \frac{1718 \times C_1}{60 \times R} = \frac{1718 \times 13.92}{60 \times 7137} = 0.055846434$$

$$= 0^\circ 3' 21.05''$$

$$\delta_2 = \frac{1718 \times C_2}{60 \times R} = \frac{1718 \times \cancel{13.92}\ 20}{60 \times 7137} = \cancel{0.055846434} = 0.08028163$$

$$= \cancel{0^\circ 3'} 21$$

$$= 0^\circ 4' 49.01''$$

$$\delta_3 = \frac{1718 \times C_{n_3}}{60 \times R} = \frac{1718 \times 16.44}{60 \times 7137} = 0.04188$$

$$= 0^\circ 2' 30.77''$$

Deflection Angle

$$\Delta_1 = \delta_1 = 0^\circ 3' 21.05''$$

$$\Delta_2 = \Delta_1 + \delta_2 = 0^\circ 8' 21.04''$$

$$\Delta_3 = \Delta_2 + \delta_3 = 0^\circ 13' 1.80''$$

$$\Delta_4 = \Delta_3 + \delta_4 = 0^\circ 17' 51.7''$$

$$\Delta_5 = \Delta_4 + \delta_5 = 0^\circ 22' 41.78''$$

$$\Delta_6 = \Delta_5 + \delta_6 = 0^\circ 27' 31.77''$$

$$\Delta_7 = \Delta_6 + \delta_7 = 0^\circ 32' 21.76''$$

$$\Delta_8 = \Delta_7 + \delta_8 = 0^\circ 37' 11.75''$$

$$\Delta_9 = \Delta_8 + \delta_9 = 0^\circ 42' 1.78''$$

$$\Delta_{10} = \Delta_9 + \delta_{10} = 0^\circ 45' 51.73''$$

and so on

Given data

$\Delta AKM = 130°$, $\Delta KMC = 140°$

1st arc Radius = (7337 - 300) = 7037

2nd arc radius = (7337 - 200) = 7137

Chainage of intersection Point

(7337 - 400) = 6937

Required:

tangent Point = ?

Compound Curvature = ?

Solution

$K = 180° - 130° = 50°$

$B = 180° - 140° = 40°$

$\varphi = \alpha + \beta = 90°$

$I = 180 - \varphi = 180 - 90° = 90°$

$KT_1 = KN = R_2 \tan(\alpha/2)$

$= 7037 \tan(50/2)$

$= 3281.40\text{m}$

$$MN = MT_2 = R_3 \tan(\beta/2)$$
$$= 7137 \tan(40^\circ/2)$$
$$= 2597.65$$

$$KM = MT_2 + KT_1 = 3281.40 + 2597.65$$

$$KM = 5879.05$$

Now

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

$$BK = \frac{MK \sin\beta}{\sin I} = \frac{5879.05 \times \sin 40^\circ}{\sin 90} = 3779.21$$

$$BM = \frac{MK \sin\beta}{\sin I} = \frac{5879.05 \times \sin 50^\circ}{\sin 90} = 4503.88$$

$$T_2 = KT_1 + BK = 3281.40 + 3779.21 = 7060.61\,m$$

$$T_3 = MT_2 + BM = 2597.65 + 4503.88 = 7101.53^m$$

$$L_2 = \frac{\pi R_2 \alpha}{180} = \cancel{\pi \times 70\overset{37}{60}.61 \times 40}$$

$$\frac{\pi \times 7037 \times 50}{180} = 6137.82\,m$$

$$L_s = \frac{\pi R_3 \beta}{180} =$$

$$\frac{\pi \times 7137 \times 40}{180} = 4980.64$$

Chainage of Intersection Point
$= 6937m$

Chainage of intersection Point

$- T_2 = -7060.61$

chainage of $T_1 = -123.61m$

PLus $L = +\ 6137.82m$
$= 6014.21m$

Chainage of Compound Curvature

(N) PLus $L_s = 4980.04m$

Chainage of $T_2 = 10994.25m$