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Date: ___/___/___

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Subject Advance Engineering Surveying

Submitted To Engr. Farhan

Dated 24/8/2020.

Q1:-

Solution:-

$R = 300m \quad \Delta = 60^\circ$

(a) Arc definitions-

$S = 30m$

$$R = \frac{S}{D_a} \times \frac{180}{\pi}$$

$$300 = \frac{30 \times 180}{D_a \, \pi} \quad \text{or} \quad D_a = 5.730 \quad \text{Ans-}$$

(b) Chord definition

$$R \sin \frac{D_c}{2} = \frac{S}{2}$$

$$300 \sin \frac{D_c}{2} = \frac{30}{2}$$

$$D_c = 5.732 \qquad \text{Ans-}$$

(ii) Length of The Curve

$$l = R\Delta \frac{\pi}{180} = 300 \times 60 \times \frac{\pi}{180}$$

$$= 314.16m \quad \text{Ans-}$$

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(ii) Tangent length

$$T = \frac{R\Delta\pi}{180} = \frac{\cancel{300 \times 60 \times \pi}}{180} \cancel{-3}$$

$300 \times \tan\frac{60}{2}$

$= 173.21 m$ Answer.

(iii) Length of long chord

$$L = 2R\sin\frac{\Delta}{2} = 2 \times 300 \times \sin\frac{60}{2}$$

$= 300m$ Ans-

(iv) Mid-Cordinate.

$$M = R\left[1 - \cos\frac{\Delta}{2}\right] = 300\left[1 - \cos\frac{60}{2}\right]$$

$= 40.19 m$ Answer

(V) Apex distance

$$E = R\left[\sec\frac{\Delta}{2} - 1\right] = 300\left[\sec\frac{60}{2} - 1\right]$$

$$= 46.41\,m$$ Ans.

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Q2:-

Two Road having a deviation -
- - - - - - - To set The Curve
by

→ offset from chords (use Peg Inteval 20m if needed).

Solution:-

$R = 200m \quad \Delta = 25\ 45^{\circ}$

Length of tangent $= 200\tan \frac{45}{2}$

$\boxed{= 82.84m}$

Chainage of $T_1 = 1839.2 - 82.84$

$\boxed{= 1756.36m}$

Length of Curve $= R \times 45 \times \pi/180$

$\boxed{= 157.08m}$

Chainage of Forward tangent T_2

$= 1756.36 + 157.08 - 1913.94m$

(a) By offsets From length chord

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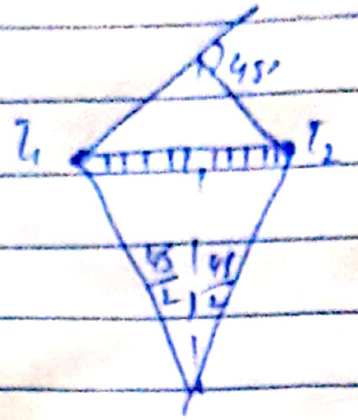

Distance of $DT = \frac{L}{2} - R\sin\frac{\Delta}{2} = 200\sin\frac{45}{2}$

$= 76.54$

Measuring 'x' From D

$$y = \sqrt{R^2 - x^2} - \sqrt{R^2 - (L/2)^2}$$

At $x = 0$

$O_0 = 200 - \sqrt{200^2 - 76.54} = 200 - 184.78$

$O_0 = \boxed{15.220}$

$O_1 = \sqrt{(200)^2 - (10)^2} = 184.78 = 14.97m.$

$O_2 = \sqrt{(200)^2 - (20)^2} - 184.78 = 14.22m.$

$O_3 = \sqrt{(200)^3 - (30)^2} - 184.78 = 12.984$

$O_4 = \sqrt{(200)^2 - (40)^2} - 184.78 = 11.18m$

$O_5 = \sqrt{(200)^2-(50)^2} - 184.78 = 8.87m$

$O_6 = \sqrt{(200)^2-(60)^2} - 184.78 = 6.01m$

$O_7 = \sqrt{(200)^2-(70)^2} - 184.78 = 2.57m$

at T_{11} $O = 0.00$

(b) Method of bisection.

Central ordinate at $= D = R(1-\cos\frac{\Delta}{2})$

$= 200(1-\cos\frac{45}{2})$

$= 15.22$

ordinate at

$D_1 = R(1-\cos\frac{\Delta}{4}) = 200(1-\cos\frac{45}{4})$

$= 3.84m.$

ordinate at

$D_2 = R(1-\cos\frac{\Delta}{8}) = 200(1-\cos\frac{45}{8})$

$= 0.96m.$

(c) Offsets From tangents.

$O_x = \sqrt{R^2 + x^2} - R$

chainage of T_1 = 1756.36m

~~Form~~ 30m chain It is at

= 58 chains + R_0 − 36 m

$x_1 = 30 - 16.36 = 1364.$

$x_2 = 43.64$

$x_3 = 73.64m.$

and Last is at x_4 tangent length − 72.84m

$O_1 = \sqrt{(200)^2 + (13.64)^2} - 200 = 0.46m$

$O_2 = \sqrt{(200)^2 + (4364)^2} - 200 = 4.71m.$

$O_3 = \sqrt{(200)^2 + (7364)^2} - 200 = 13.13m.$

$O_4 = \sqrt{(200)^2 + (7284)^2} - 200 =$

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(d) Offset from chord Product.

length of First Subt chord = 13.64 c_1

length of normal chord = 30 = c_2.

Since length chain is 157.8m ~~$c_3 c_4$~~

$c_3 = c_4 = c_5 = 30$

Chainage of Forward tangent - 1913.44m.

= 63 chains + 23.44m.

$$O_1 = \frac{c_1}{2R} = \frac{13.64}{2 \times 200} = 0.47.$$

$$O_2 = \frac{c_2(c_1+c_2)}{2R} = \frac{30(30+13.64)}{2 \times 200} = 3.27.$$

$$O_4 = \frac{c_n(c_{n-1}+c_4)}{2R} = \frac{23.44(23.44+30)}{2 \times 200}$$

= 3.13m.

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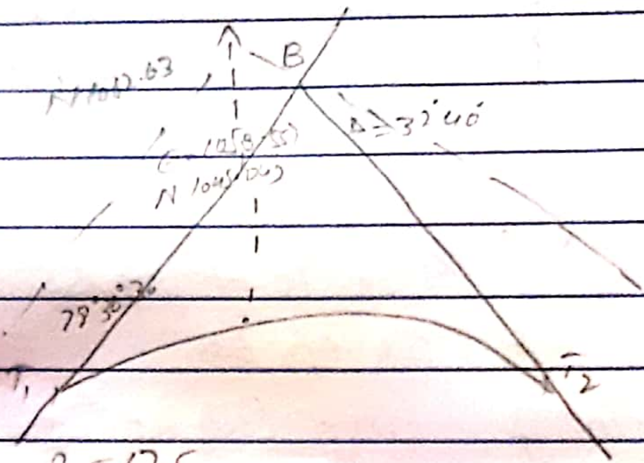
Q3

Solution.



R = 17.5

Solution:

$$R = 17.5 \times 20 = 350m$$

$$\Delta = 32^\circ 40' = 32.667^\circ$$

$$\frac{\Delta}{2} = 16^\circ 20'$$

Tangent length $T = R \tan \frac{\Delta}{2}$

$$= 350 \times \tan 16^\circ 20' = 102.57m$$

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

$$= \frac{\pi \times 250 \times 32.667}{180} = 199.55m$$

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Chainage of T_1 = chainage of P.I − T

$= (51 + 9.38) - 102.57.$

$= (51 \times 20 + 9.35) - 102.57.$

$= 926.78m = 46 + 6.78.$

Chainage of T_2 $T_1 + L$

$= 926.78 + 199.55 = 1126.33m.$

$= 56 + 6.33.$

Length of First Sub chord

$C_1 = (46+20) - (46+6.78) = 13.22m$

Length of last Subchord C_2

$C_f = (56+6.33) - (56+6.33) - (56+0)$

$= 6.33m.$

Number of Normal Chords:

$N = 56 - 47 = 9.$

Total number of Chords

$n = 9 + 2 = 11.$

Combination of $T_1 + T_2$.

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Bearing of $IT_1 = \alpha = 180 + \text{bearing of } T_1 I$
$= 180° + 78° 36 30''$
$= 258° 36' 30''$

Bearing of $IT_2 = \beta = \text{Bearing of } IT_1 + \phi$
$= \text{Baring of } IT_1 + (180 - \Delta)$
$= 258° 36' 30'' - (88 - 32 40')$
$= 111° 16' 30''$

Coordinate of T_1

Easting of $T_1 = E_{T_1} = \text{Easting } I + \bar{T} \sin \alpha.$
$= 1058.55 + 102.57 \times \sin 258° 36' 30''$
$E = 958.00 m.$

Northing of $T_1 = N_{T_1} = \text{Norting of } I + \bar{T} \cos \alpha.$
$= 1045.04 + 102.57 \times \cos 258° 36' 30''$
$N = 1024.78 m.$

Coordinate of T_2.

Easting of $T_2 = E T_2 = \text{Easting } I + T \sin \beta$

$= 1058.55 + 102.57 \times \sin 111° 16' 30'$
~~E = N~~ $= E \; 1154.13 m.$

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Northing of $T_2 = N_{T_2} = N_{PI} + T\cos B$.

$= 1045.04 + 102.57 \times \cos 111^\circ 16' 30''$

$N\ 1007.812m$

Tangential angle.

$\delta = 1718.9 \frac{C}{R}$ minute

δ_2 to $\delta_{10} = 1718.9 \frac{20}{350} = 98.223'$

$\delta_{11} = 1718.9 \ \frac{6.33}{350} = 31.088'$

Deflection angle

$\Delta_1 = \delta_1 = 64.925' = 1^\circ 04' 55''$

$\Delta_2 = \Delta_1 + \delta_2 = 64.925' + 98.223'$

$= 163.148' = 2^\circ 43' 09''$

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$\Delta_3 = \Delta_2 + \delta_3 = 163.148' + 98.223'$

$= 261.371' = 4° 21' 22''$

$\Delta_4 = \Delta_3 + \delta_4 = 261.371 + 92.228' = \cancel{35}$
$359.594 = 5° 59' 36'$

$\Delta_5 = \Delta_4 \delta_5 = 359.594' + 98.223 =$
$457.81' = 7° 37' 39'$

$\Delta_6 = \Delta_5 - \delta_6 = 457.81 + 98.223 =$
$= 556.040 = 9° 16' 024$

$\Delta_7 \quad \Delta_6 + \delta_7 = 556.040 + 98.223 =$
$654.263 = 1854' 16''$

$\Delta_8 = \Delta_7 + \delta_8 = 654.263 + 98.223$
$= 752.488 = 12° 32' 29''$

$\Delta_9 = \Delta_8 + \delta_9 = 752.486 + 98.223' =$
$850.709 = 14° 1643'$

$\Delta_{10} = \Delta_9 + \delta_{10} = 850.709 + 98.223$
$= 948.932' = 15° 48' 56''$

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$\Delta_{11} = \Delta_{10} + \delta_{11} = 948.932 + 31.088$

$\cancel{= 9 = 8}\ 980.020 = 16^\circ 20' 01''$

Check.

$\Delta_{11} = \frac{\Delta}{2} = 16^\circ 20'$ (okay)