ID	7904
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SECTION	A
SUBJECT	Advanced Survey
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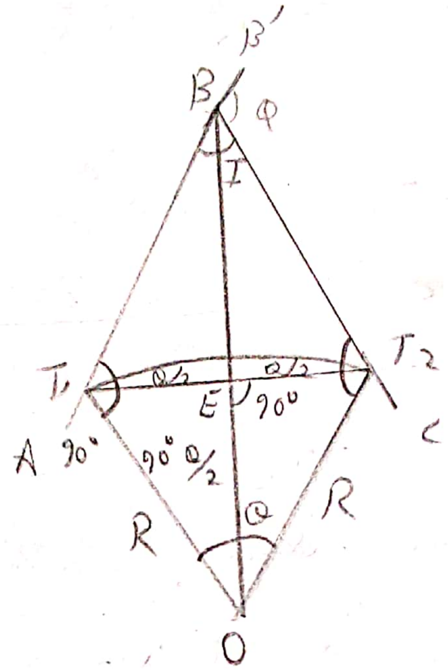
Question No (1) Part (A)



Two tangents meet at a chainage of (I.) ft 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 chord.
3) Mid ordinate and external distance

Solution:

ID = 7904

Degree of curve = 5°

$$R = \frac{5729.58}{2} = 1145.91576$$

So we First find the tangent lenth $BT_1 = BT_2 = R\tan\left(\frac{\theta}{2}\right) = 1145.916 \times \tan\left(\frac{14°13'22}{2}\right)$

$= 142.96557ft$

$$L = \left(\frac{\pi R \theta}{180°}\right)$$

$$L = \frac{3.14 \times 1145.916 \times 14°13'23''}{180°}$$

$$L = 284.46ft$$

Now we find chainage

chainage of intersection Point = B = 7904ft

So, $T_1 = 7904 - 142.9655 \rightarrow$ tangent length

$T_1 = 7761.0345$

Now

$T_2 = 7761.0345 + 284.46 \rightarrow$ Length of curve

$T_2 = 8045.4945$

Now

Length of chord:

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

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

$$l = 283.731\ 26?$$

Now

Mid ordinates

$$EF = R\left(1 - \cos\left(\frac{\theta}{2}\right)\right)$$

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

$$EF = 8.81547 ft^2$$

Now

External distance

$$BF = R\left(\frac{1}{\cos\left(\frac{\theta}{2}\right)} - 1\right)$$

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

$$BF = 8.883886.$$

Question (1) Part (B)

ID # 7904 = 7.904

Chainage (m)	0	30	60	90	120	150
offset cm	7.904	7.904+3 = 10.904	7.904+4 = 11.904	7.904-2 = 5.904	7.904-4 = 3.904	7.904-3 = 4.904

As we know from the Question that $b = 30m$

So we can find the are that

$$Area = \frac{b}{3}\left(7.904 + 3.904 + 2(11.904) + 4(10.904) + 4(5.904)\right) + \left(\frac{3.904 + 4.904}{2}\right) \times b$$

$b = 30$

Area = 1028.48 + 132.12

So

Area = 1,160.6

Question No # 2

A Circular curve of Radius (ID - 700)m deflection angle 20°40' is to set out between the two straights having chainage of the point of intersection as (ID - 400)m. Callculate all the data necessary for setting out the curve using deflection

Ans:-

As we assume that radius, so it become ID - 700

7904 - 700 = 904

R = 904m

deflection angle = 20°40'.

Now chainage at point of intersection which chainage at allso assume = ID - 5000

$7904 - 5000 = 2904m$

Peg interval $= 20m$

So, we can find tangent length

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

$= 904 \tan\left(\frac{20°40'}{2}\right)$

$= 164.8279m.$

Now

length of curve

$L = \frac{\pi R \theta}{180°}$

$L = \frac{3.14 \times 904 \times 20°90'}{180°}$

$L = 325.90m$

Now chainage

$T_1 = 2906 - 164.827$

$T_1 = 2741.173$

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Chainage at $T_2 = 2741.173 + 325.90$

$T_2 = 3067.07$

Now eve can find

Length of 1st chord $= \cancel{2}760 - 2741.173$

$$\boxed{C_1 = 18.827m}$$

Length of last subchord

$C_{last} = 3067.07 - 3050$

$$\boxed{C_{last} = 17.07}$$

So, wknow that

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

$\ldots\ldots C_{last-1} = 20m$

Now we can find

Numbes of chords

No of chords = $\frac{\text{Length of curve} - c_1}{\text{Interval}}$

$= \frac{325.90 - 18.827}{20}$

$=$ 15 chords.

Now deflection angle

$\delta_1 = \frac{1718.9 c_1}{60R}$

$\delta_1 = \frac{1718.9 \times 18.827}{60 \times 904}$

$\delta_1 = 0°35'47.9''$

$\delta_2 = \frac{1718.9 \times 20}{60 \times 904} = 0°38'\cancel{01}.73''$

So,

$\delta_2 = \delta_3 = \delta_4 \dots \delta_{14} = 0°38'1.73''$

$\delta_{15} = \frac{1718.9 \times 17.07}{60 \times 964}$

$\delta_{15} = 0°32'27.45''$

Now Total deflection (tangential) angle for chords are

$\Delta_1 = \delta_1 = 0°35'47.9''$

$\Delta_2 = \delta_1 + \delta_2 = \Delta_1 + \delta_2 = 1°13'49.63''$

$\Delta_3 = \Delta_2 + \delta_3 = 1°51'51.36''$

$\Delta_4 = \Delta_3 + \delta_4 = 2°29'53.09''$

$\Delta_5 = \Delta_4 + \delta_5 = 3°7'54.82''$

$\Delta_6 = \Delta_5 + \delta_6 = 3°45'56.55''$

$\Delta_7 = \Delta_6 + \delta_7 = 4°23'58.28''$

$\Delta_8 = \Delta_7 + \delta_8 = 5°2'0.01''$

$\Delta_9 = \Delta_8 + \delta_9 = 5°40'1.74''$

$\Delta_{10} = \Delta_9 + \delta_{10} = 6°18'3.47''$

$\Delta_{11} = \Delta_{10} + \delta_{11} = 6°56'5.2''$

$\Delta_{12} = \Delta_{11} + \delta_{12} = 7°34'6.93''$

$\Delta_{13} = \Delta_{12} + \delta_{13} = 8°12'8.66''$

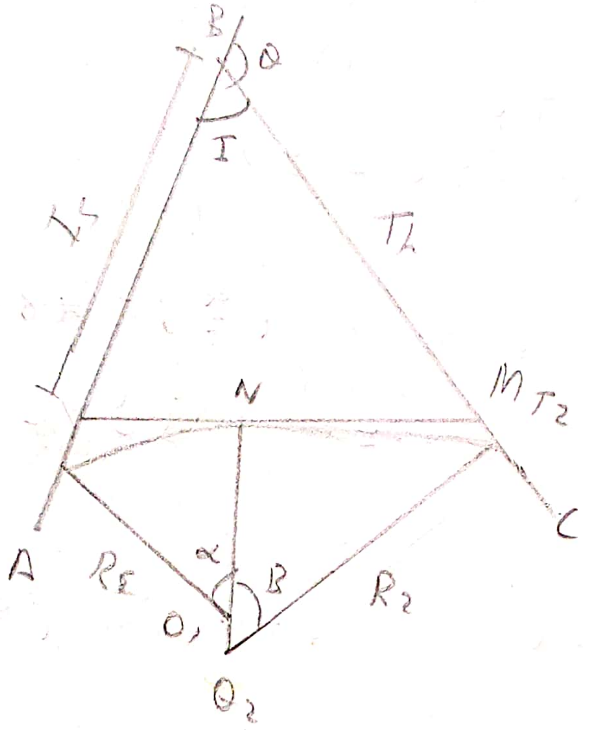
$D_{14} = D_{13} + S_{14} = 8°50'10.39''$

$\Delta_{15} = \Delta_{14} + S_{15} = 9°28'12.12''$

$\text{check} = \frac{\theta}{2} = \frac{20°40'0''}{2}$ ~~$= 10°20'$~~

$= 10°20'0''$

Question No 3



SOLUTION

$\alpha = 130^\circ$

$B = 140^\circ$

Radius of 1st arc = 7904 − 300 = 7604

" " = 7904 − 200 = 7704

chainage at intersection Point:

7904 − 400 = 7504m

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As

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

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

So

$\alpha + B = 90^\circ$

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

$kT_1 = kN = R_s \tan\left(\frac{\alpha}{2}\right) = 7604 \tan\left(\frac{50}{2}\right)$

$kT_1 = kN = 3545.803\,m$

Now

$MN = MT_2 = R_2 \tan\left(\frac{B}{2}\right) = 7704 \tan\left(\frac{40}{2}\right)$

$MN = MT_2 = 2804.026\,m$

Now we find km

$km = MT_2 + kN = 3545.803 + 2804.026$

$= 6349.829$

Now for further solution

Find ΔBKM by sin rule

$$\frac{BK}{\sin\beta} = \frac{MK}{\sin(I)}$$

$$BK = \frac{MK \sin\beta}{\sin(I)} = \frac{6349.829 \times \sin(40)^\circ}{\sin(90^\circ)}$$

$$BK = 4081.59\,m$$

$$BM = \frac{MK \sin(\alpha)}{\sin(I)}$$

$$= \frac{6349.829 \times \sin(50)^\circ}{\sin(90)^\circ}$$

$$BM = 4,864.25$$

Now we find

$$T_s = KT_1 + BK = 3545.803 + 4081.59$$

$$T_s = 7627.393$$

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Now

$T_L = MT_2 + Bm = 2804.026 + 4864.25$

$T_L = 7668.276$

Now

$$L_s = \frac{\pi R_s \alpha}{180} = \frac{3.14 \times 7604 \times 50}{180}$$

$L_s = \cancel{7884.55 m}$

$L_s = 6632.377$

$$L_L = \frac{\pi R_L \beta}{180^\circ} = \frac{3.14 \times 7704 \times 40^\circ}{180^\circ}$$

$L_L = 5375.68 m$

Now we find chainage

Now we find chainage

chainage of intersection point minus T_s

$T_1 = 7504 - 7627.393$

$= -123.393$

$L_s = -123.393 + 6632.377$

$= 6508.98$

change at $T_2 = 6508.98 + 5375.68m$

$= 11884.66m.$