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Section = A

ID = 7901

Subject = Advance Survey (II)

Semester = 4th

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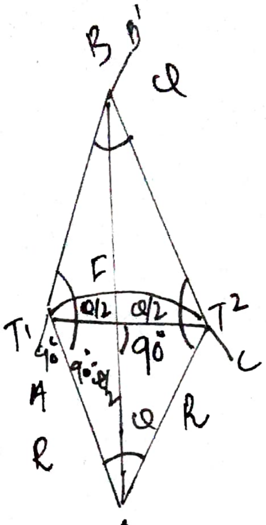
Q NO 1
(a)



Question # 1
Part (a)
Two tangents meet at a chainage of 1101 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:

$ID = 7901$
Degree of curve $= 5°$

$R = \frac{5729.58}{2} = 1145.916\ ft$

So, we first find the tangent length

$BT_1 = BT_2 = R\tan\left(\frac{\theta}{2}\right) = 1145.916 \times \tan\left(\frac{14°13'22''}{2}\right)$

$= 142.965$ ft

Now length of curve

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

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

$l = 284.46$ ft

Now we find chainage.

chainge of intersection point $= B = 7901$ ft

So, $T_1 = 7901 - 142.9655 \rightarrow$ tangent leng

$T_1 = 7758.3045$

Now

$T_2 = 7758.3045 + \underset{\text{length of curve}}{\underbrace{284.46}}$

$T_2 = 8042.7645$

length of chord: (3)

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

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

$$l = 283.731 \text{ ft}^2$$

Now

Mid ordinates:

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

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

$$EF = 8.8154 \text{ ft}^2$$

Now,

External distance:

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

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

$$BF = 8.8838 \text{ ft}$$

(P.T.O)

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Question No 1 (b).

ID No - 7901 = 7.901

Chainage (m)	0	30	60	90	120	150
Offset (m)	7.901	7.901+3 = 10.901	7.901+4 = 11.901	7.901+2 = 8.901	7.901 -4 = 3.901	7.901-3 = 4.901

As we know that from the question that b = 30 m

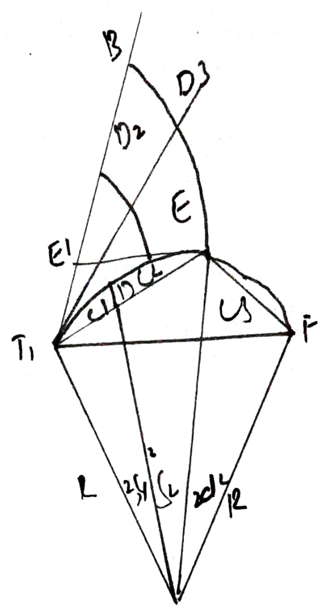
$$Area = \frac{b}{3}\left(7.901 + 3.901 + 2(11.901) + 4(10.901) + 4(8.901)\right) + \frac{(3.901 + 4.901)}{2} \times b$$

b = 30

Also b = 1028.12 + 132.18

Area = 1160.9 m^2.

Question # 02. (5)



Question #02

A circular curve of Radius (ID-200)m deflection angle 20° 40' 15 to be set out b/w the two straights having chainage of the point of intersection as (ID-400)m Calculate all the data necessary for setting out the curve using deflection arc.

As we assume the radius so

ID - 7000 = 7901 - 7000 = 901m.

R = 901 m.

deflection angle = 20° 40'.

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Chainage at point of intersection which we also assume = ID - 4000 = 7901 - 4000

Chainage = 3901 m.

Peg interval = 20 m

So, we can find : Tangent length

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

$= 901 \tan\left(\frac{20^\circ 40'}{2}\right)$

$BT_1 = BT_2 = 165 \cdot 1926\,m.$

Now,

length of curve:

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

$L = \frac{3.14 \times 901 \times 20^\circ 40'}{180^\circ}$

$L = 321 \cdot 61\,m.$

Now

Chainage

$T_1 = 3901 - 165.91 \rightarrow$ Tangent length

$T_1 = 3735.09$

chainage at $T_2 = 3735.09 + 321.61$
length of curve.

$T_2 = 4056.7$

Now we can find

length of 1st sub chord $= 3775 - 3735.09$

$\boxed{C_1 = 39.91 m}$

length of last sub chord $= C_{15} =$
$4056.7 - 4034$

$\boxed{C_{15} = 22.7 m}$

So, we know that

$C_2 = C_3 = C_4 = C_5 = C_6 = C_7 = C_8 = C_9 =$
$C_{10} = C_{11} = C_{12} = C_{13} = C_{14} = 20m$

Now we can find No of chords

⑧

No of chords $= \frac{\text{length of curve} - C}{\text{interval}}$

$$\frac{321.61 - 39.91}{20}$$

$= 15$ chords

Now deflection angle:

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

$$\delta_1 = \frac{1718.9 \times 39.91}{60 \times 906}$$

$\delta_1 = 1°4'52''$

$\delta_2 = 0°37'56.69''$

So,

$\delta_2 = \delta_3 = \delta_4 \ldots \delta_{14} = 0°37'56.69''$

$$\delta_{14} = \frac{1718.9 \times 22.7}{60 \times 901}$$

$\delta_{15} = 0°51'2.41''$

(9)

Now total deflection (Tangential) angle for the chords are.

$\Delta 1 = \delta 1 = 1^\circ 4' 52''$

$\Delta 2 = \delta 1 + \delta 2 = \Delta 1 + \delta 2 = 1^\circ 41' 41.69''$

$\Delta 3 = \Delta 2 + \delta 3 = 2^\circ 20' 45.28''$

$\Delta 4 = \Delta 3 + \delta 4 = 2^\circ 58' 42.07''$

$\Delta 5 = \Delta 4 + \delta 5 = 3^\circ 36' 38.76''$

$\Delta 6 = \Delta 5 + \delta 6 = 4^\circ 14' 35.45''$

$\Delta 7 = \Delta 6 + \delta 7 = 4^\circ 52' 32.14''$

$\Delta 8 = \Delta 7 + \delta 8 = 5^\circ 30' 28.83''$

$\Delta 9 = \Delta 8 + \delta 9 = 6^\circ 8' 25.52''$

$\Delta 10 = \Delta 9 + \delta 10 = 3^\circ 21' 28.9''$

$\Delta 11 = \Delta 10 + \delta 11 = 7^\circ 24' 18.9''$

$\Delta 12 = \Delta 11 + \delta 12 = 8^\circ 12' 15.59''$

$\Delta 13 = \Delta 12 + \delta 13 = 8^\circ 40' 12.28''$

$\Delta 14 = \Delta 13 + \delta 14 = 9^\circ 18' 8.97''$

$\Delta 15 = \Delta 14 + \delta 15 = 10^\circ 15' 11.45''$

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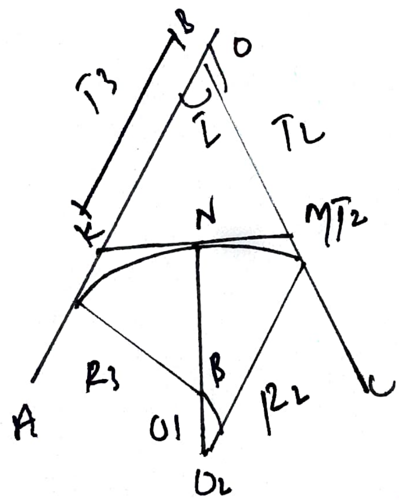
Check $= \frac{\theta}{2} = \frac{20^\circ 40' 0''}{2} = 10^\circ 11' \cdot 10''$

Corrected

Question #03



Solution :-

$\alpha = 130^\circ$

$\beta = 140^\circ$

Radius of 1st arc $= 7901 - 300 = 7601$

" 2nd arc $= 7901 - 200 = 7701$

(11)

chainage at intersection point =

$7901 - 400 = 7501\,m$

As

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

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

So,

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

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

$KT_1 = KN = R_1 \tan\left(\frac{\alpha}{2}\right) = 7601 \tan\left(\frac{50}{2}\right)$

$KT_1 = KN = 3541.73\,m.$

Now

$MN = MT_2 = R_2 \tan\left(\frac{\beta}{2}\right) = 7701 \tan\left(\frac{40}{2}\right)$

2801.71

$MN = MT_2 = 2801.71\,m.$

Now we find KM:

$KM = MI_2 + KN = 3541.73 + 2801.71$

$= 6343.44\,m$

Now for further solution find ΔBKM by sin rule.

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

$$BK = \frac{MK\sin\beta}{\sin(I)} = \frac{6343 \times \sin(50^\circ)}{\sin 90^\circ}$$

$BK = 4861.51\,m$

Now we find

$T_3 = KT_1 + BK = 3541.73 + 4081.61$

$T_3 = 7623.34$

Now

$T_B = MI_2 + BM = 2801.71 + 4861.51$

$T_B = 7663.22\,m.$

Now

$$Ls = \frac{\pi R s \alpha}{180} = \frac{3.14 \times 7601 \times 50}{180}$$

$Ls = 6631.12m$

$$Lc = \frac{\pi R \phi}{180^\circ} = \frac{3.14 \times 7701 \times 40^\circ}{180^\circ}$$

$Lc = 5371.07m$

No we find chainage
chainage of intersection point

minus TS

$T_1 = 7501 - 7021.38$

$T_1 = -128.38$

Plus ES $= -128.38 + 5371.07$

$= 6504.74$

chainage of $T_2 = 6504.74 + 5371.07$

$T_2 = 11875.81m$