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SECTION: A

ID : 7906

Subject: Advance Survey (survey II).

Samister :- 4th

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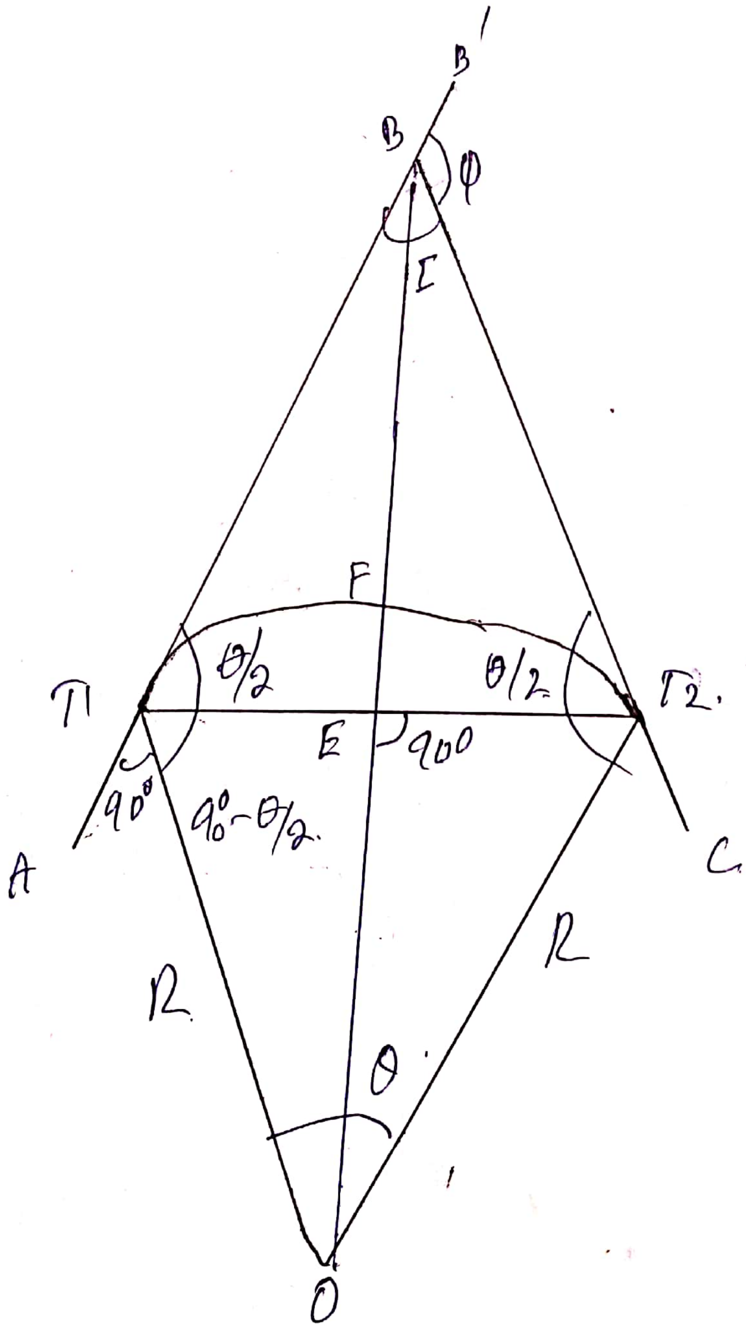
24 April, 2020.

QUESTION (1)
Part (a).



Question # 01

Part (a).

Two tangents meet at a chainage of (ID) 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

$ID = 7906$

Degree of curve $= 5°$

$$R = \frac{5729.58}{5} = 1145.916 \text{ ft}$$

So, we First Find the tangent length

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

$$= 142.9655 ft$$

Now length of curve

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

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

$$L = 284.46 ft$$

Now we find Chainage

Chainage of Intersection point = B = 7906 ft.

So, $T_1 = 7906 - 142.965 \rightarrow$ tangent length

$$T_1 = 7763.034.$$

Now

$T_2 = 7763.034 + 284.46 \rightarrow$ length of curve.

$$T_2 = 8047.494$$

Now

Length of chord:

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

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

$$l = 283.731\, ft^2$$

Now

Mid ordinates

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

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

$$EF = 8.8154\, ft^2$$

Now

External distance

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

(4)

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

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

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Question # 01(b)

ID No # 7906 = 7.906

Chainage (m)	0	30	60	90	120	150
offset (m)	7.906	7.906+3 = 10.906	7.906+4 = 11.906	7.906−2 = 5.906	7.906 −4 = 3.906	7.906 −3 = 4.906

As we know from the question.

That $b = 30m$

So we can find the area than

$$\text{Area} = \frac{b}{3}\Big(7.906 + 3.906 + 2(11.906) + 4(10.906) + 4(5.906)\Big) + \left(\frac{3.906 + 4.906}{2}\right) \times b.$$

$b = 30$

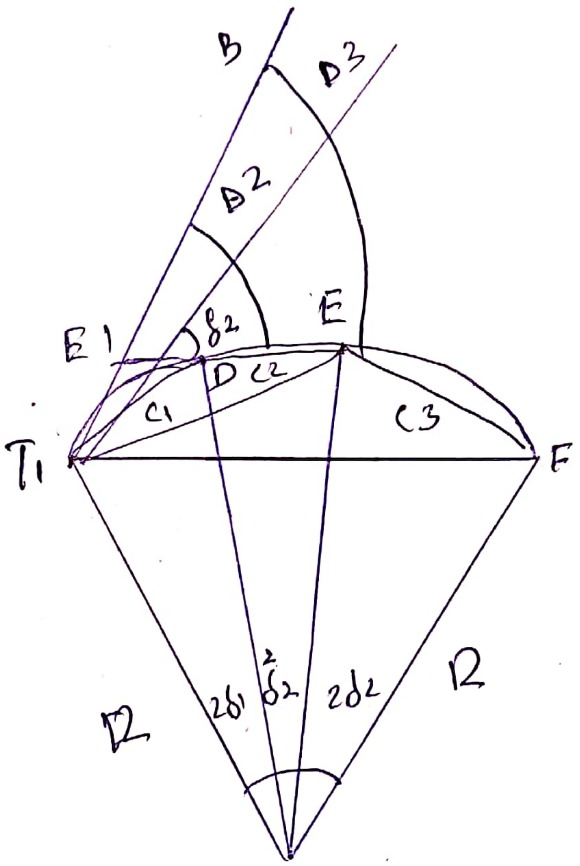
Area $= 1028.72 + 132.18$

(6)

Sol

Area = $1160.9\,m^2$

QUESTION # 02



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Question #02

A circular curve of Radius (ID-200)m deflection angle 20°40' is to be set out between 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 angl

As we assume the radius so it become

ID-7000 = 7906-7000 = 906m.

R = 906m.

deflection angle = 20°40'

chainage at point of intersection which also we assume = ID-4000 = 7906-4000

Chainge = 3906m

Peg interval = 20m

So, we can find: Tangent length

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

$= 906\tan\left(\frac{20^\circ 40'}{2}\right)$

$BT_1 = BT_2 = 165.1926m$

Now

Length of curve

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

$L = \frac{3.14 \times 906 \times 20^\circ 40'}{180^\circ}$

$L = 326.62m$

Now

Chainage

$T_1 = 3906 - 165.19 \rightarrow$ Tangent length

$T_1 = 3740.81$

Chainage at $T_2 = 3740.81 + 326.62 \rightarrow$ length of curve

$T_2 = 4067.43$

Now we can find:

Length of 1st sub Chord = $3775 - 3740.81$

$$\boxed{C_1 = 34.19m}$$

Length of last sub cord = $C_{15} = 4067.43 - 4040$

$$\boxed{C_{15} = 27.43m}$$

So, we know that

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

No we can find No of chords

$$\text{No of chords} = \frac{\text{Length of curve} - C1}{\text{Interval}}$$

$$= \frac{326.62 - 34.19}{20}$$

$$= \cancel{14} \text{ Chords}$$

15 Chords

Now deflection angle:

$$\delta_1 = \frac{1718.9\ C1}{60R.}$$

$$\delta_1 = \frac{1718.9 \times 34.19}{60 \times 906}$$

$\delta_1 = 1°4'52''$

$\delta_2 = \frac{1718.9 \times 20}{60 \times 906} = 0° 37' 56.69''$

So,

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

$\delta_{15} = \frac{1718.9 \times 27.43}{60 \times 906}$

$\delta_{15} = 0° 52' 2.48''$

Now Total deflection (Tangential) angle for the chords are:

$D_1 = \delta_1 = 1°4'52''$

$D_2 = \delta_1 + \delta_2 = D_1 + \delta_2 = 1°42'48.69''$

$D_3 = D_2 + \delta_3 = 2°20'45.38''$

$D_4 = D_3 + \delta_4 = 2°58'42.07''$

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$\Delta_5 = D_4 + \delta_5 = 3^\circ 36' 38.76''$

$D_6 = \Delta_5 + \delta_6 = 4^\circ 14' 35.45''$

$D_7 = D_6 + \delta_7 = 4^\circ 52' 32.14''$

$D_8 = D_7 + \delta_8 = 5^\circ 30' 28.83''$

$D_9 = \Delta_8 + \delta_9 = 6^\circ 8' 25.52''$

$D_{10} = D_9 + \delta_{10} = 6^\circ 46' 28.9''$

$D_{11} = \Delta_{10} + \delta_{11} = 7^\circ 24' 18.9''$

$\Delta_{12} = D_{11} + \delta_{12} = 8^\circ 2' 15.59''$

$D_{13} = D_{12} + \delta_{13} = 8^\circ 40' 12.28''$

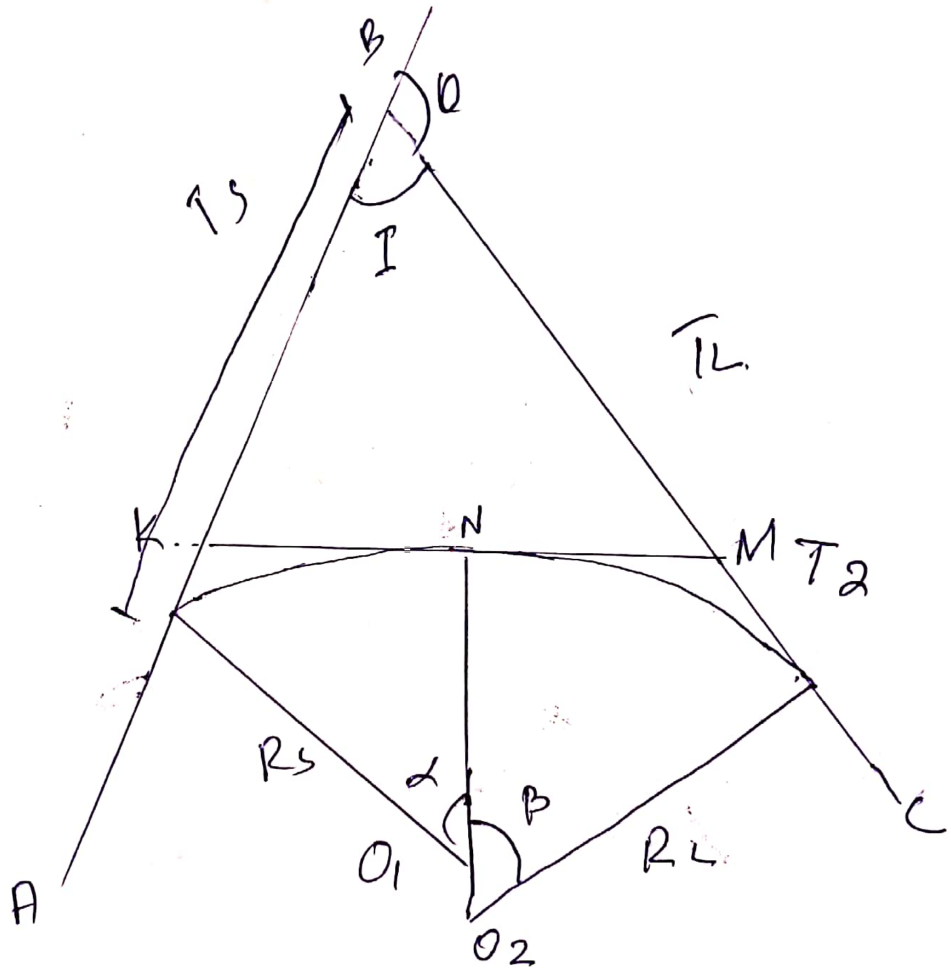
$D_{14} = D_{13} + \delta_{14} = 9^\circ 18' 8.97''$

$D_{15} = D_{14} + \delta_{15} = 10^\circ 15' 11.45''$

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

correcled

QUESTION #03



Solution

$\alpha = 130^\circ$

$\beta = 140^\circ$

Radius of 1st arc = $7906 - 300 = 7606$

" " 2nd arc = $ID - 200 = 7906 - 200$
$= 7706$

Chainage at intersection Point =

$7906 - 400 = 7506m$

As

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

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

So $\emptyset = \alpha + \beta = 90^\circ$

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

$KT_1 = KN = R_s \tan\left(\frac{\alpha}{2}\right) = 7606 \tan\left(\frac{50}{2}\right)$

$KT_1 = KN = 3546.73 m$

Now

$MN = MT_2 = R_L \tan\left(\frac{\beta}{2}\right) = 7706 \tan\left(\frac{40}{2}\right)$

$MN = MT_2 = 2804.75 m$

Now we find KM

$KM = MT_2 + KN = 3546.73 + 2804.75$

$= 6351.48 m$

Now for further solution.

Find Δ BKM by sin rule.

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

(16)

$$BK = \frac{MK \sin \beta}{\sin(I)} = \frac{6351.48 \times \sin(40)^{\circ}}{\sin(90^{\circ})}$$

$$BK = 4082.65\,m$$

$$BM = \frac{MK \sin(\alpha)}{\sin(I)} = \frac{6351.48 \times \sin(50^{\circ})}{\sin(90^{\circ})}$$

$$BM = 4865.51\,m.$$

Now we find

$$T_S = KT_1 + BK = 3546.73 + 4082.65$$

$$T_S = 7629.38$$

Now

$$T_L = MT_2 + BM = 2804.75 + 4865.51$$

$$T_L = 7670.26\,m$$

Now

$$L_S = \frac{\pi R_S \alpha}{180} = \frac{3.14 \times 7606 \times 50}{180}$$

$$L_S = 6634.12\ m$$

$$L_L = \frac{\pi R_L \beta}{180^\circ} = \frac{3.14 \times 7706 \times 40^\circ}{180^\circ}$$

$$L_L = 5377.07m$$

Now we find chainage.

Chainage of intersection point minus T_S

$$T_1 = 7506 - 7629.38$$

$$T_1 = -123.38$$

Plus $L_S = -123.38 + 6634.12$

$$= 6510.74$$

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Chainage of T_2 = 6510.74 + 5377.07 m

T_2 = 11887.81m