NAME: OWAIS USMAN

ID: 7897

SECTION: A

SEMESTER: 4th

SUBJECT: ADVANCE SURVEY {SURVEY II}

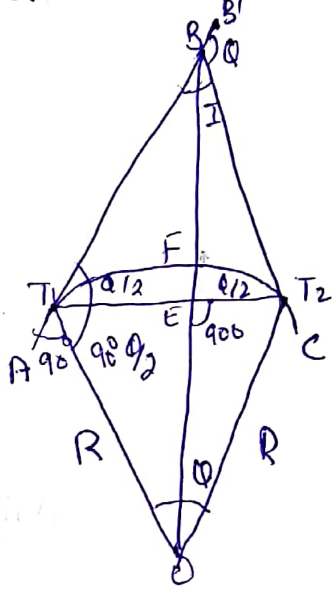
SUBMITTED TO: ENGR. ABDUL FARHAN

QUESTION # 1

Part a Two tangents meet at a chainage of (I.D) ft with the deflection angle of 14° ~~21~~ 13' 23''. Degree of curve is 5°.

Calculate

1) Chainage at the beginning and end of the curve.



SOLUTION:

$ID = 7897$

Degree of curve $= 5^\circ$

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

Now finding the tangent length

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

$$= 1145.916 \times \tan\left(\frac{14^\circ \cancel{21'}\, 13' 23''}{2}\right)$$

$$\boxed{= 142.9655 \text{ ft}}$$

Length of curve

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

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

$$\boxed{L = 284.46 \text{ ft}}$$

Now we will find chainage

chainage of intersection point $= B = 7897$ ft

So,

$T_1 = 7897 - 142.9655$

$T_1 = 7754.034$

Now

$$T_2 = 7754.034 + 284.46$$

$$T_2 = 8038.494$$

2) Length of long chord

Solution:

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

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

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

3) Mid ordinate and External distance

Solution.

Mid ordinate

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

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

$$\boxed{EF = 8.8154 \text{ ft}}$$

Now,

External distance

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

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

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

QUESTION #1

Part b

Find the area from the data obtained from chain survey, as shown in the table below, using simpson's rule

SOLUTION :

$$ID = 7897 = 7.897$$

Chainage (m)	0	30	60	90	120	150
Offset (m)	7.897	7.897+3 = 10.897	7.897+4 = 11.897	7.897-2 = 5.897	7.897-4 = 3.897	7.897-3 = 4.897

we know that

$$b = 30\,m$$

Now we can find the area

$$Area = \frac{30}{3}\Big(7.897 + 3.897 + 2(11.897) + 4(10.897) + 4(5.897)\Big) + \left(\frac{3.897 + 4.897}{2}\right) \times 30$$

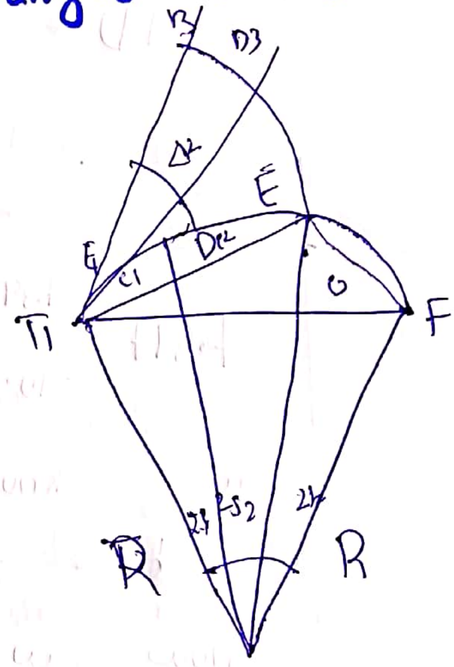
$$Area = 1027.64 + 131.91$$

$$\boxed{Area = 1159.55}$$

QUESTION # 2

A circular curve of radius (I.D − 200)m deflecting right through 20°, 4′, is to be set out b/w two straight having chainage of the point of intersection as (ID−400)m

Calculate all the data necessary for setting out the curve using deflection angle method, with Peg interval being 20m.



SOLUTION :-

Assume the radius

= ID − 7000
= 7897 − 7000
R = 897

Deflection angle = 20°40′

chainage at point of intersection which we also assume

= ID − 4000
= 7897 − 4000

$\boxed{\text{Chainage} = 3897}$

$\boxed{\text{Peg interval} = 20m}$

Now, we can find tangent length

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

$$= 897 \tan\left(\frac{20^\circ 40'}{2}\right)$$

$$BT_1 = BT_2 = 163.5516 \text{ m}$$

Now

Length of curve

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

$$L = \frac{3.14 \times 897 \times 20^\circ 40'}{180^\circ}$$

$$\boxed{L = 323.38 \text{m}}$$

Now

Chainage

$$T_1 = 3897 - 163.55$$

$$T_1 = 3733.45$$

$$T_2 = 3733.45 + 323.38$$

$$T_2 = 4056.83$$

Now we can find

Length of 1st sub chord $= C_1 = 3768.01 - 3733.45$

$$\boxed{C_1 = 34.56 \text{m}}$$

Length of last sub chord $= C_{15} = 4056.83 - 4029$

$$\boxed{C_{15} = 27.83}$$

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 cords

$$\text{No of chords} = \frac{\text{Length of curve} - C_1}{\text{Interval}}$$

$$= \frac{323.38 - 34.56}{20}$$

$$= 14.441$$

$$\boxed{\text{No. of chords} = 15 \text{ Chords}}$$

Now deflection angle

$$\delta_1 = \frac{1718.9 \, C_1}{60R}$$

$$= \frac{1718.9 \times 34.56}{60 \times 897}$$

$$\boxed{\delta_1 = 1^\circ 6' 13.59''}$$

$$\delta_2 = \frac{1718.9 \times 20}{60 \times 897}$$

$$\boxed{\delta_2 = 0^\circ 38' 19.53''}$$

So

$\delta_2 = \delta_3 = \delta_4 \cdots \cdots \delta_{14} = 0^\circ 38' 19.53''$

7

$$S_{15} = \frac{1718.9 \times 27.83}{60 \times 897}$$

$$\boxed{S_{15} = 0^\circ 53' 19.8''}$$

Now total deflection (tangential) angle for the cord are

$\Delta_1 = S_1 = 1^\circ 6' 13.59''$

$\Delta_2 = S_1 + S_2 = \Delta_1 + S_2 = 1^\circ 44' 33.12''$

$D_3 = D_2 + S_3 = 2^\circ 20' 52.65''$

$D_4 = D_3 + S_4 = 3^\circ 1' 12.18''$

$D_5 = D_4 + S_5 = 3^\circ 39' 31.71''$

$D_6 = D_5 + S_6 = 4^\circ 17' 51.24''$

$D_7 = D_6 + S_7 = 4^\circ 56' 10.77''$

$D_8 = D_7 + S_8 = 5^\circ 34' 30.3''$

$D_9 = D_8 + S_9 = 6^\circ 12' 49.83''$

$D_{10} = D_9 + S_{10} = 6^\circ 51' 49.36''$

$D_{11} = D_{10} + S_{11} = 7^\circ 29' 28.89''$

$D_{12} = D_{11} + S_{12} = 8^\circ 7' 48.42''$

$D_{13} = D_{12} + S_{13} = 8^\circ 46' 7.95''$

$D_{14} = D_{13} + S_{14} = 9^\circ 24' 27.48''$

$D_{15} = D_{14} + S_{15} = 10^\circ 2' 47.01''$

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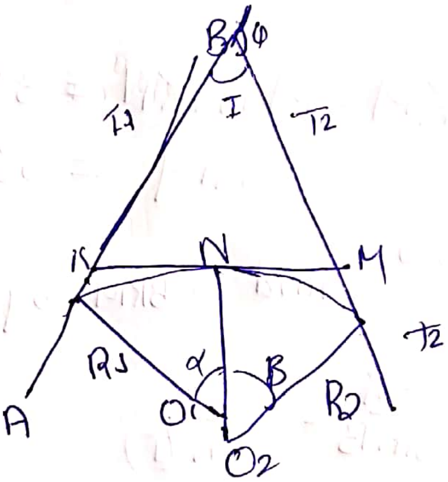
QUESTION #3

Two tangents AB & BC are intersected by a line KM. The angles AKM and KMC are 130° & 140° respectively. The radius of 1st arc is (ID-300) m and 2nd arc is (ID-200) m. Find the chainage of tangent points and the point of compound curve given that the chainage of intersection point is (ID-400) m.

SOLUTION:



$\alpha = 130^\circ$

$\beta = 140^\circ$

Radius of 1st arc $= 7897 - 300$
$= 7597$

Radius of 2nd arc $= 7897 - 200$
$= 7697$

chainage at intersection point $= 7897 - 400$
$= 7497$

As

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

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

So

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

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

$KT_1 = KN = R_S \tan\left(\frac{\alpha}{2}\right) = 7597 \tan\left(\frac{50}{2}\right)$

$$\boxed{KT_1 = KN = 3542.53\,m}$$

Now

$MN = MT_2 = R_2 \tan\left(\frac{B}{2}\right) = 7697 \tan\left(\frac{40}{2}\right)$

$$\boxed{MN = MT_2 = 2801.47\,m}$$

Now we find KM

$KM = MT_2 + KN = 3542.53 + 2801.47$

$$\boxed{KM = 6344\,m}$$

Now find $\triangle BKM$ by sin rule

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

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

$$= \frac{6344 \sin(40^\circ)}{\sin(90^\circ)}$$

$$\boxed{BK = 4077.84}$$

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

$$= \frac{6344 \sin(50^\circ)}{\sin(90^\circ)}$$

$$\boxed{BM = \cancel{4865.51}\ 4859.78}$$

Now we find

$T_s = KT_1 + BK = 3542.53 + 4077.84$

$$\boxed{T_s = 7620.37}$$

Now

$T_2 = MT_2 + BM = 2801.47 + 4859.78$

$$\boxed{T_2 = 7661.25}$$

Now

$$L_s = \frac{\pi R_s \alpha}{180} = \frac{3.14 \times 7597 \times 50^\circ}{180}$$

$$\boxed{L_s = 6626.27}$$

$$L_L = \frac{\pi R_L \beta}{180} = \frac{3.14 \times 7697 \times 40^\circ}{180^\circ}$$

$$\boxed{L_L = 5370.79}$$

Now, we find chainage
chainage of intersection point minus T_s

$T_1 = 7497 - 7620.37$

$$\boxed{T_1 = -123.37 m}$$

Plus $L_s = -123.37 + \cancel{5370.79}$ 6626.27

$= \cancel{5247.42}$ 6502.9

chainage of $T_2 = \cancel{5247.42} +$
6502.9 + 5370.79

$$\boxed{T_2 = 11873.69 m}$$

END