Advance Engineering Survey.

7970

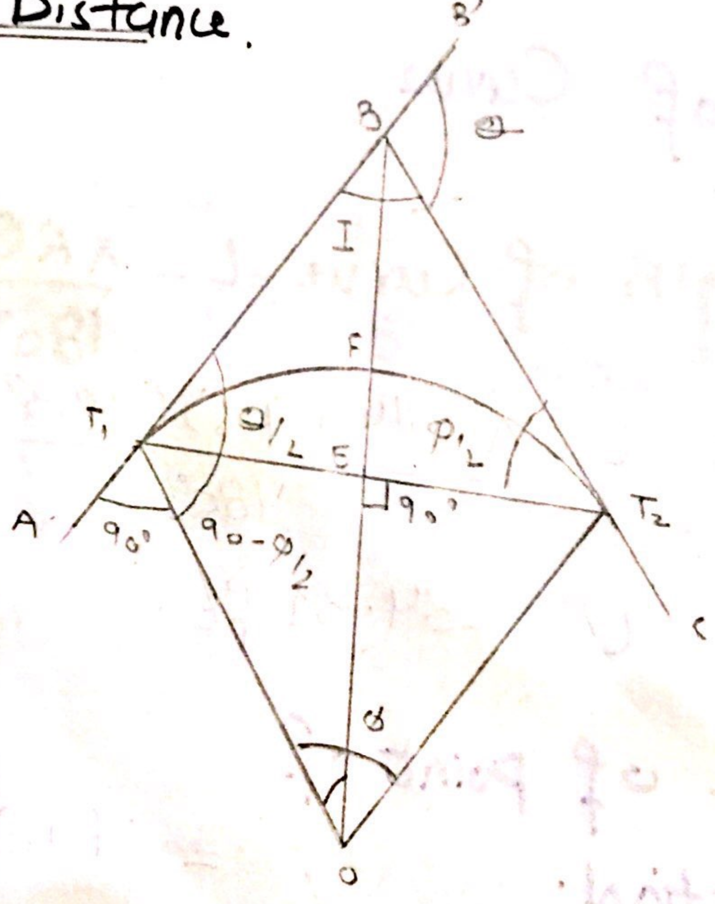
B

Submmited: To ENGG Farhan.

Que: no # 1

Q. To tangents meet at a chainage of 7+97.0. with deflection angle of 14°13'23". Degree of curve is 5°

1. T_1, T_2
2. Length of Chord
3. Mid Ordinate
4. External Distance.



Arc Defination:-

Let R = Radius of Curve.
D = Degree of Curve.

Then:
$$\frac{D}{360} = \frac{100}{2\pi R}$$

$$R = \frac{5729.58}{D} \text{ feet}$$

$$R = \frac{5729.58}{5^\circ}$$

$$R = 1145.916 \text{ feet.}$$

Tangent length: $= BT_1 = BT_2 = R\tan\frac{\theta}{2}$

$$BT_1 = BT_2 = 1145.916 \tan 14^\circ 13' 23''$$

$$BT_1 = BT_2 = 1145.916(0.2534)$$

$$BT_1 = BT_2 = 290.37 \text{ feet.}$$

2. Length of Chord:

$$\text{Length of Chord} = l = 2R\sin\left(\frac{\theta}{2}\right)$$

$$l = 2R\sin\frac{\theta}{2}$$

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

$$l = 2(1145.916)(0.123)$$

$$l = 281.89 \text{ ft}.$$

Length of Curve

$$\text{length of Curve} = L = \frac{\pi R\theta}{180°}$$

$$L = \frac{\pi(1145.916)(14°13''23'')}{180°}$$

$$L = 284.31 \text{ ft}.$$

Chainage of point of Intersection.	$= 7+97.0$
Minus Tangent length.	$= -2+90.37$
Chainage of T_1	$= 506.63.$

Plus L $= +2+84.31$

Chainage of $T_2 = 7+90.94$.

3. <u>Mid Ordinate:.</u>

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

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

$$EF = 1145.916\,(1 - 0.992)$$

$$EF = 9.167 \text{ ft}.$$

$$\text{External Distance} = FB = R\left(\sec\frac{\theta}{2} - 1\right)$$

$$BF = 1145.916\left(\frac{1}{\cos\theta/2} - 1\right)$$

$\therefore \sec x = \frac{1}{\cos x}$

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

$$BF = 1145.916\,(1.007 - 1)$$

$$BF = 8.02141 \text{ ft}$$

Que:no#1

b. Find the area from the data obtained from chain survey, as shown in the table below. The first offset is $7970 \div 1000$, 7.97.

Chainage (m)	0	30	60	90	120	150
offset (m)	7.970	7.970+3	7.970+4	7.970-2	7.970-4	7.970-3

Simspon's One Thir Rule:.

$$\text{Area} = \frac{b}{3}\left(h_1 + h_7 + 4(h_2 + h_4 + h_6) + 2(h_3 + h_5)\right)$$

→ In General Case,

$$\text{Area} = \frac{b}{3}(X + 2O + 4E)$$

X = Sum of first and last offset
O = sum of the remaining odd offset.
E = sum of Even offset.

As Intercept is even number. So we will calculate Area from 1st to 5th.

And the area b/w 5th and 6th is calculate separately.

OFFset No	OFFset	Simpsons Multiplier	Product.
1	7.970	1	7.970
2	10.79	4	43.16
3	11.97.	2	23.94
4	5.97.	4	23.88
5	3.97	1	3.97.
			$\Sigma = 102.92$

$$\text{Area } (h_1 - h_5) = \frac{30}{3}(102.92) = 1029.2\,m^2$$

$$\text{Area } (h_5 - h_6) = \frac{30}{2}(3.97 + 4.97) = 134.1\,m^2$$

Total Area $= 1029.2 + 134.1$

Total Area $= 1163.3\,m^2$.

Ques:no#2

(1)

A circular Curve of Radius (7970-200) deflecting right through $20°40'$ is to be set out b/w two straights having Chainage of point of Intersection as (7970-400) Using deflection angle method to setout Curve.

Peg INt # 20m

Solution:- *

Given Data,

$$\text{Radius} = 7970/11 = 724.54\text{m}$$

$$\theta = 20°40'$$

Chainage at B = 7970-400 = 7570m.

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

$$'' = 724.54 \tan\left(\frac{20°40'}{2}\right)$$

(2)

$BT_1 = BT_2 = 724.54(0.18233)$

$'' = 132.10m.$

Length of Curve:

$$L = \frac{\pi R \theta}{180^\circ} = \frac{3.14(724.54)(20^\circ 40')}{180^\circ}$$

$L = 261.21m.$

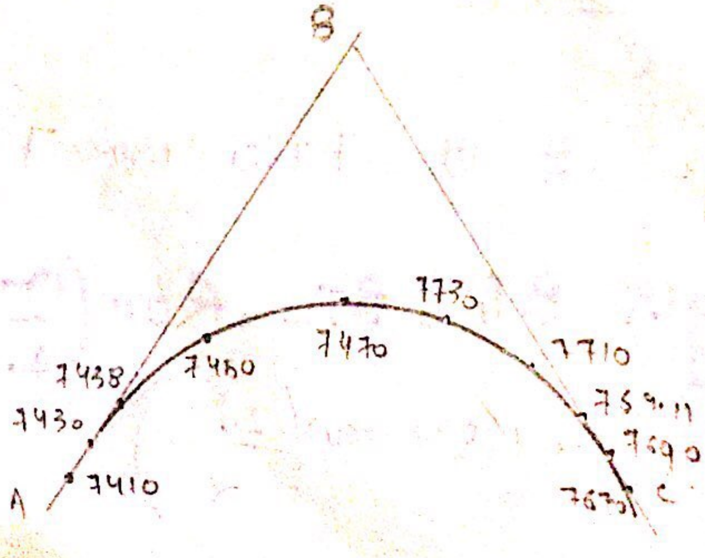
Chainage at B $= 7570m.$

Minus tangent length $= -132.10m.$

Chainge of T_1 $= 7437.9m$

Plus L $= 261.21m$

Chainage of T_2 $= 7699.11m.$



For Initial Chord:

7410 7430 7438 7450 ~~47~~ 7470

Initial Chord = 7450 - 7438

Initial Chord = 12m.

For Final Chord:

7670 7690 7699.11 7710 7730.

Final Chord = 7699.11 - 7690

Final Chord = 9.11m.

For No. of Chord:

= 7690 - 7450.

= 240

Now Divide by Peg interval we get;

$= \frac{240}{20} =$ 12 no. of Chords.

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

By Deflection Angle :- *

$$\delta_1 = \frac{1718.9 \times C_1}{R} \text{ (min)}$$

$$\delta_1 = \frac{1718.9 \times C_1}{60 \times R} \text{ Degree.}$$

$$'' = \frac{1718.9 \times 12.}{60 \times 724.54}$$

$$'' = 0^\circ 28' 28.13''$$

$$\delta_{14} = \frac{1718.9 \times C_{14}}{60 \times 724.54}$$

$$\delta_{14} = \frac{1718.9 \times 9.11}{60 \times 724.54}$$

$$\delta_{14} = 0^\circ 21' 36.75''$$

$$\delta_2 = \frac{1718.9 \times C_2}{60 \times R}$$

$$\delta_2 = 0^\circ 47' 26.88''$$

→ So $\delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = \delta_8 = \delta_9$
$= \delta_{10} = \delta_{11} = \delta_{12} = \delta_{13}.$

$\Delta_1 = \delta_1 = 0°28'42.13''$

$\Delta_2 = \delta_2 + \delta_1 = \Delta + \delta_2 = 1°16'9.01$

$\Delta_3 = \Delta_2 + \delta_3 = 2°3'35.89''$

$\Delta_4 = 2°51'2.77''$

$\Delta_5 = 3°38'29.65''$

$\Delta_6 = 4°25'56.53''$

$\Delta_7 = 5°13'23.41''$

$\Delta_8 = \cancel{6°48'17.17''} = 6°0'50.29''$

$\Delta_9 = 6°48'17.17''$

$\Delta_{10} = 7°35'44.05''$

$\Delta_{11} = 8°23'10.93''$

$\Delta_{12} = 9°10'37.81''$

$\Delta_{13} = 9°58'4.69$

$\Delta_{14} = \Delta_{13} + \delta_{14} = 10°19'41.44''$

Check * $\frac{\theta}{2} = \frac{20°40'}{2} = 10°20'0''$

$\Delta_{14} = \frac{\theta}{2} = \frac{20°40'}{2} = 10°20'0''$

Que: no # 3

Solution:- *

Given Data;

$\Delta AKM = \alpha = -130 + 180^\circ = 50^\circ$

$\Delta KMC = \beta = -140 + 180^\circ = 40^\circ$

Radius $= R_1 = 7970 - 300 = 7670m$

Radius $= R_2 = 7970 - 200 = 7770m$

Chainage at B point $= 7970 - 400 = 7570m$

1. Tangent points = ?
2. Compound Curvature = ?

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

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

Now:-

$$KT_1 = KN = R_1 \tan(\alpha/2)$$

$$= 7670 \tan\left(\frac{50^\circ}{2}\right)$$

$$= 3576.57m.$$

Now:-

$$MN = MT_2 = R_2 \tan(\beta/2)$$

$$= 7770 \tan\left(\frac{40^\circ}{2}\right)$$

$$= 2828.04m.$$

$$KM = MT_2 + KT_1 = 2828.04 + 3576$$

$$= 6404.04m.$$

Now ΔBKM By Sine Rule..

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

$$= \frac{6404.04 \sin(40^\circ)}{\sin 90^\circ}$$

$$= 4116.43 m.$$

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

$$BM = \frac{6404.04 \sin 50^\circ}{\sin 90^\circ}$$

$$BM = 4905.77 m.$$

$\longrightarrow T_L = KT_1 + BK$

$$= 3576.57 + 4116.43$$

$$= 7693 m.$$

$T_S = MT_2 + BM.$

$$= 2828.04 + 4905.77$$

$$= 7733.81 m$$

$$L_L = \frac{\pi R_1 \alpha}{180^\circ} = \frac{3.14 \times 7670 (50^\circ)}{180^\circ}$$

$$L_L = 6689.94 m.$$

$$L_s = \frac{\pi R_2 \beta}{180°}$$

$$L_s = \frac{3.1417770\ (40°)}{180°}$$

$L_s = 5421.73m.$

Chainage of Beginning of the curve T_1

= Chainge at Intersection point $- T_L$

= 7570 - 7693

= -123 m.

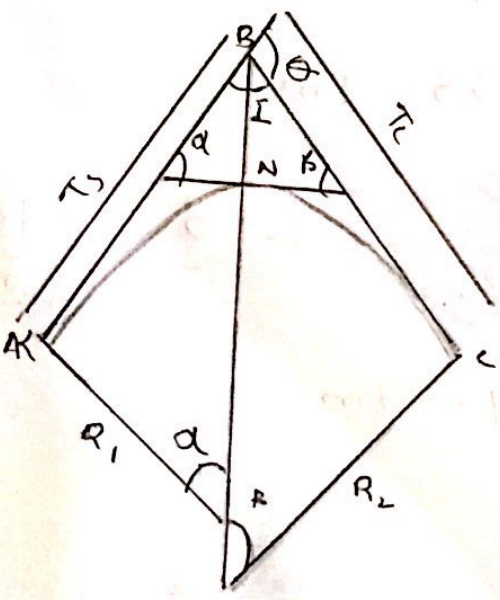
Plus L_L = -123 + 6689.94

= 6566.94.

Chainage of Compound Curvature:.

Plus L_s = 6566.94 + 5421.73.

T_2 = 11988.67 m



Chainage of point of Intersection: $= 7 + 97.0$ ft

Minus Tangent length $= -2 + 90.37$ ft

Chainage at T_1 $= 7679.63$ ft

Plus L $= +284.31$ ft

Chainage of T_2 = ~~7~~ ~~9~~ 7963.94 ft.

Que: no#1 I Assume 797.0 in calculating in the above was mistake