Name:

Hassan Zaib Khattak

ID:

7958

Section:

B

Deptt:

BE(C)

Subject:

Advanced Engrng Surveying

Submitted to:

Engr. Abdul Farhan

Iqra National University

Question No 01 (a):

Two tangents meets at a Chainage of (I.D) ft with the deflection angle of 14°13'23". Degree of Curve is 5°.

Calculate

1) Chainage at the beginning and end of the curve.
2) Length of long Chord.
3) Mid ordinate and External distance.

Given Data:

⇒ Degree of Curve = 5°

⇒ Deflection angle = θ = 14°13'23"

⇒ Chainage of Intersection = I.D ft = 79587 ft

(Here 7958 is my I.D)

Required Data:

⇒ Chainage at beginning and end of curve.

⇒ Length of long Chord
⇒ Mid ordinate and external distance

Solution:

For part (1):

$$\text{Tangent length} = R \tan\left(\frac{\Delta}{2}\right)$$

$$\text{Length of Curve} = \frac{\pi R \Delta}{180^\circ}$$

$$\text{Radius} = 5729.58/D \text{ ft}$$

$$R = 5729.58/5^\circ$$

$$\boxed{R = 1145.917 \text{ ft}}$$

$$\text{Tangent length} = R \tan \Delta/2$$

$$= 1145.91 \tan\left(\frac{14^\circ 13' 23''}{2}\right)$$

$$\boxed{\text{Tangent length} = 142.967 \text{ ft}}$$

$$\text{Length of Curve} = \frac{\pi R \Delta}{180}$$

$$= \frac{\pi R \Delta}{180} = \frac{\pi \times 1145.91 \times 20^\circ 40'}{180}$$

Length of Curve = 284.457ft

Chainage of intersection = 7958.7ft
minus Tangent Length = -142.96ft
Chainage of T_1 = 7815.04ft
Add Curve length = 284.45 ft
Chainage of T_2 = 8099.49ft

For part (2):

Length of long Chord = $2R\sin\Delta/2$

$= 2(1145.91)\sin(14°13'23''/2)$

Length of long Chord = 283.727ft

For part (3):

mid ordinate = $R(1-\cos\Delta/2)$

$= 1145.91(1-\cos(14°13'23''/2))$

mid ordinate = 8.817ft

External distance = $R(\sec(14°13'23''/2) - 1)$

$= 1145.91(\sec(14°13'23''/2) - 1)$

External distance = 8.887t

Result:

Radius: 1145.917t

Tanget length: 142.967t

Curve length: 284.457t

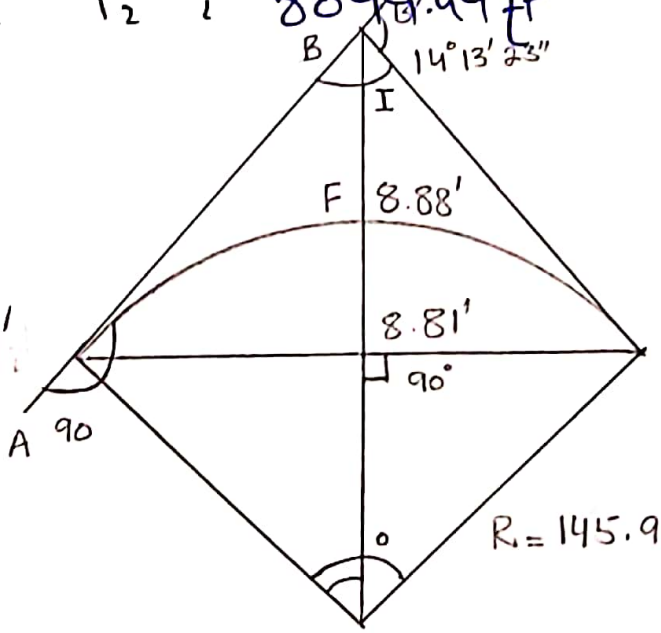
long Chord length: 283.727t

Mid ordinate: 8.817t

External distance: 8.887t

Chainage T_1: 7815.057t

Chainage T_2: 8099.497t



Question No 01 (b)

Find the area from the data obtained from Chain Survey, as shown in the table below, using Simpson one third rule. The first offset is your I.D ÷ 1000

Chainage (m)	0	30	60	90	120	150
offset (m)	7.958	10.958	11.958	5.958	3.958	4.958

$$ID = \frac{7958}{1000} = 7.958$$

Solution:

offsets = 6
intercept = 5
interval = 30

As we know that Simpson one third rule is applicable to odd number of offsets or even number of intercept So we will calculate area b/w 1st to 5th offset by

Simpson one third rule and blw 5th to 6th offset by Trepazoidal rule.

Offset No	E/O	offsets	Simpson Multiplier	Product
1	1st	7.958	1	7.958
2	E	10.958	4	43.832
3	O	11.958	2	23.916
4	E	5.958	4	23.832
5	last	3.958	1	3.958

$\Sigma = 103.496\,m$

$$\text{Area } (h_1 - h_5) = \frac{b}{3} \times (\Sigma \text{ product of offset})$$

$$\frac{30}{3} \times 103.496$$

$$\boxed{\text{Area } (h_1 - h_5) = 1034.96\,m^2}$$

$$\text{Area } (h_5 - h_6) = \frac{30}{2}(h_5 + h_6)$$

$$= \frac{30}{2}(3.958 + 4.958)$$

$$\boxed{\text{Area}(h_5 - h_6) = 133.74\,m^2}$$

Total area = 1034.96 + 133.74

Total area = 1168.70m²

Result:

Total Area = 1168.70m² or 0.11687 ha

Question No 02:

A Circular curve of radius (ID - Assume value)m deflection right through 20°40', is to be act out between two straight having Chainage of the point of intersec-tion as (ID - Assume value). Calculate all the data necessary for the setting out the curve using deflection angle method with Peg interval 20m

Solution:

⇒ Deflection angle = Δ = 20°40'

⇒ radius = (ID - 7656) = 7958 - 7656 = 302m

(7656 is assume value)

⇒ Chainage of intersection = ID - 5006

= 7958 - 5006 = 2952m

(5006 is assume value)

Required Data:

⇒ Set of your by deflection Method.

Solution:

$$R = 302 \times 2 = 604\ m$$

$$\text{Tanget length} = R \tan\left(\frac{\Phi}{2}\right)$$

$$= 604 \tan\left(\frac{20°40'}{2}\right)$$

Tangent length = 110.12m

$$\text{Length of curve} = \frac{\pi R \Phi}{180}$$

$$= \frac{\pi \times 604 \times 20°40'}{180}$$

Length of Curve = 217.86m

Chainage of intersection = 2952 m
minus Tanget length = - 110.12 m
Chainage T_1 = 2841.88 m
Add Curve length = 217.86 m
Chainag T_2 = 3059.74m

Length of the 1st Chord

C_1 = 2860 - 2841.88 m

C_1 = 18.12m

No of Chord = $\frac{\text{length of curve} - C_1}{\text{Interval}}$

= $\frac{217.86 - 18.12}{20}$ = 10

Length of last Chord

C_1 = 3059.74 - 3040

$C_1 = 19.74m$

$C_2 = C_3 = C_4 = C_5 = C_6 = C_7 = C_8 = C_9 = \quad = 20m$

By Deflection angle

$$\delta_1 = \frac{1718.9 \times C_1}{60 \times R} \text{ (degree)}$$

$$\delta_1 = \frac{1718.9 \times 18.12}{60 \times 604}$$

$$\delta_1 = 0^\circ 51' 34.02''$$

$$\delta_{2-10} = \frac{1718.9 \times C_{2-10}}{60 \times R} \text{ (degree)}$$

$$= \frac{1718.9 \times 20}{60 \times 604}$$

$$\delta_{2-10} = 0^\circ 56' 55.03''$$

$$\delta_{11} = \frac{1718.9 \times C_{11}\ (\text{degree})}{60 \times R}$$

$$\delta_{11} = \frac{1718.9 \times 19.74}{60 \times 604}$$

$$\boxed{\delta_{11} = 0^\circ 56' 10.64''}$$

Total deflection (Tangential) angle for the Chord are;

$\Delta_1 = \delta_1 = 0^\circ 51' 34.02''$

$\Delta_2 = \Delta_1 + \delta_2 = 1^\circ 48' 29.05''$

$\Delta_3 = 2^\circ 45' 24.08''$

$\Delta_4 = 3^\circ 42' 19.14''$

$\Delta_5 = 4^\circ 39' 14.14''$

$\Delta_6 = 5^\circ 36' 9.17''$

$\Delta_7 = 6^\circ 33' 4.2''$

$\Delta_8 = 7^\circ 29' 59.23''$

$\Delta_9 = 8^\circ 26' 54.26''$

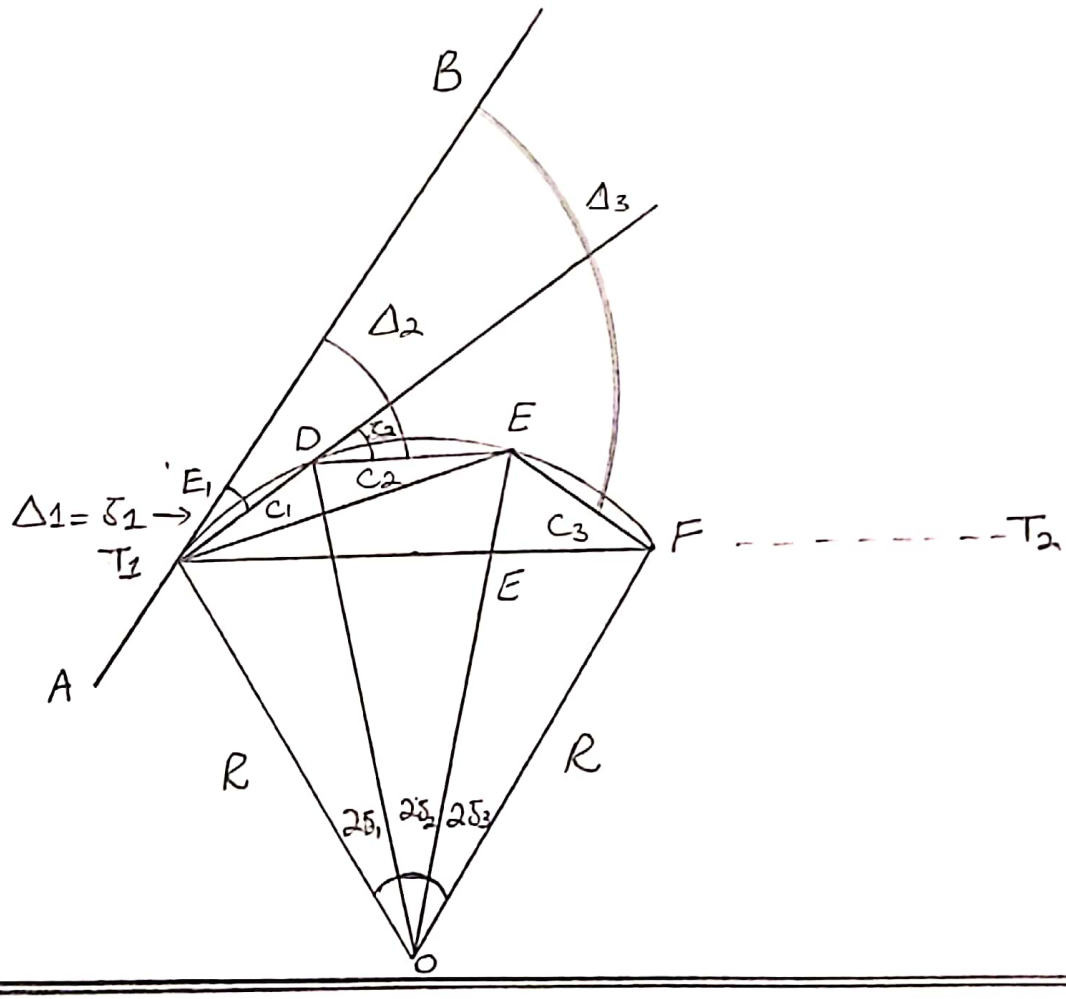
$\Delta_{10} = 9^\circ 23' 49.29''$

$\Delta_{11} = \Delta_{10} + \delta_{11} = 10^\circ 19' 59.93''$

$= \frac{20^\circ 40'}{2}$

Check $= 10^\circ 20'$

Error $= 0.07''$



Question no 03:

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

Given Data:

⇒ $\angle AKM = 130°$

⇒ $\angle KMC = 140°$

⇒ Radius of 1st arc = R_S = ID - 300

= 7958 - 300 = 7658m

⇒ Radius of the 2nd arc = R_L = ID - 200

= 7958 - 200 = 7758m

⇒ Chainage of intersection = ID - 400

= ID - 400 = 7958 - 400

= 7558m

Required Data:

⇒ Chainage of Tangent point Compound Curvature

Solution:

$\alpha = 180° - 130° = 50°$

$\beta = 180° - 140° = 40°$

$\phi = \alpha + \beta = 50° + 40° = 90°$

$I = 180° - \phi = 180° - 90°$

$I = 90°$

$KT_1 = KN = R_S \tan \alpha/2$

$= 7658 \tan(50°/2)$

$KT_1 = KN = 3570.98m$

$MT_2 = MN = R_L \tan \beta/2$

$= 7758 \tan(40°/2)$

$MT_2 = MN = 2823.68m$

$KM = KN + MN$

$KM = 3570.98 + 2823.68$

$\boxed{KM = 6394.66m}$

In $\triangle BKM$ Sine rule,

$$\frac{Bk}{MK\sin\beta} = \frac{1}{\sin I}$$

$$Bk = \frac{MK\sin\beta}{\sin I}$$

$$Bk = \frac{6394.66 \times \sin 40}{\sin(90)}$$

$\boxed{Bk = 4110.40m}$

$$\frac{BM}{MK\sin\alpha} = \frac{1}{\sin I}$$

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

$$BM = \frac{6394.66 \times \sin 50}{\sin 90}$$

$\boxed{BM = 4898.59m}$

$T_S = KT_1 + BK$

$= 3570.98 + 4110.40$

$T_S = 7681.38m$

$T_L = MT_2 + BM$

$= 2823.68 + 4898.59$

$T_L = 7722.27m$

$L_S = \frac{\pi R_S \alpha}{180}$

$= \frac{\pi \times 7658 \times 50}{180}$

$L_S = 6682.86m$

$L_L = \frac{\pi R_L \beta}{180}$

$= \frac{\pi \times 7758 \times 40}{180}$

$L_S = 5416.10m$

Results:

Chainage of intersection = 7558m

Subtract Ts = -7681.38m

Chainage T_1 = -123.38m

Add Ls = +6682.86m

Chainage of Compound Curvature = 6559.48m

Add L_L = +5416.10m

Chainage T_2 = 11975.58m