MID TERM EXAM

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Subject ⇒ Advanced Engineering Survey.

I.D ⇒ 7666

Sec ⇒ "C"

Submitted to :-

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Q1) Two tagents meet at a chainage of (I.D = 7666)ft with the deflection action angle of $14^\circ 13' 23''$. Degree of curve is 5°. Calculate

a- Chainage at the beginning and end of the curve
b- Length of long chord.
c- Mid ordinate and external distance.

Given data:-

Tanget meet at chainage = 7666 ft
Deflection angle = $14^\circ 13' 23''$
Degree of curve = 5°

Solution:-

$D = 5^\circ$

So as we know that

$R = 5729.58/D$

Putting value of D

$R = 5729.58/5 \Rightarrow 1145.917$

Tangent length $= BT_1 = BT_2$.

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

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

$B_1 = B_2 \Rightarrow 142.96$ ft.

Length of curve $\Rightarrow L = \frac{\pi R \Delta}{180}$

$\Rightarrow \frac{\pi \times 1145.91 \times 14^\circ 13' 23''}{180}$

$L = 284.45$ ft.

Chainage of intersection Point = 7666
min tangent length = -142.96 ft

Chainage of $T_1 = 7666 - 142.96$

Chainage $T_1 \Rightarrow 7523.04$ ft

Now plus $L = 284.45$

So

Chainge of $T_2 = 7523.04 + 284.45$

Chainge of $T_2 \Rightarrow 7950.45$ ft

Length of chord $= l = 2R \sin\left(\frac{\Delta}{2}\right)$

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

$$\Rightarrow 283.721 ft$$

Mid ordinat

$$R\left(1 - \cos\left(\frac{\phi}{2}\right)\right)$$

$$\Rightarrow 1145.91\left[1 - \cos\left(\frac{14^\circ 13' 23''}{2}\right)\right]$$

Midor $\Rightarrow$ 8.817 ft

External distance $\Rightarrow R\left[\sec\left(\frac{\phi}{2}\right) - 1\right]$

$$= 1145.91\left[\sec\left(\frac{14^\circ 13' 23''}{2}\right) - 1\right]$$

External distance $\Rightarrow$ 8.887 ft

Q1b:- Find the area from the data obtained from chain survey - - - - - - - - - - so on.

Sol:-

Offset No	offset	Simpon Muliplier	Product
1	7.666	1	7.666
2	10.666	4	42.664
3	11.666	2	23.332
4	5.666	4	22.664
5	3.666	2	7.332
6	4.666	1	4.666

$\Sigma = 108.324$

Area $(h_1 - h_6)$

$\Rightarrow b/3 \times 108.324$

$\frac{30}{3} \times 108.324$

Total area $\Rightarrow$ 1083.24 m^2

Q3 A Circular curve of radius (I.D - 800)m _____ interval being 20m.

Given data:-

Circula radius = 7666 - 7250 = 416m

Deflection angles = 20° 40'

Point of intersection = 7666 - 5000
⇒ 2666

Interval = 20m

Solution:-

R = 416 x 2 = 832 m

As we know that

$BT_1 = BT_2 \Rightarrow R \tan \phi/2$

$\Rightarrow 832 \tan \frac{20^\circ 40^\circ}{2}$

$BT_1 = BT_2 \Rightarrow 151.700m$

length of curve $\Rightarrow L = \frac{\pi R \phi}{180}$

$$\Rightarrow \frac{\pi \times 832 \times 20^\circ 40'}{180^\circ}$$

$L = 299.95\,m$

Chainge at point of intersection =
$\Rightarrow 2666$
minus (−) Tanget $= -103.56$
So
Chainge of $T_1 = 2666 - 103.56$
$\Rightarrow 2562.04$

Now adding $L = 299.95\,m$

Chainge $T_2 = 2562.44 + 299.95 \Rightarrow 2862.88\,m$

length of first chord $= C_1 =$
$C_1 = 2460 - 2443.02$
$\Rightarrow 16.56$

$C_2 = C_3 = C_4 = C_5 = C_6 = C_7 = C_8 = C_9$
$C_{10} = 2648.40 - 2630$
$= 18.40\,m$

By deflection method

$$S_1 = \frac{17.18.9 \times C_1}{60R}$$

$$= \frac{1718.9 \times 16.56}{60(832)}$$

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$S_1 = 0^\circ\ 55'\ 47.99''$

$$S_2 = \frac{1718 \times 20}{60 \times 832}$$

$S_2 = 1^\circ\ 7'\ 22.47''$

$S_2 = S_3 = S_4 = S_5 = S_6 = S_7 = S_8 = S_9 = S_{10}$

$$S_{11} = \frac{1718.9 \times 18.4}{60\ (832)}$$

$\Rightarrow 1^\circ\ 2'\ 0.81''$

Total angle deflection for Chord is

$\Delta_1 = S_1 = 0^\circ\ 55'\ 47.99''$

$\Delta_2 = S_1 + S_2 = 1^\circ\ 7'\ 24.47'' - 0^\circ\ 55'\ 47.99''$

$\Delta_2 = S_2 = 2^\circ\ 3'\ 11.47''$

$\Delta_3 = 2^\circ\ 51'\ 8.72''$

$\Delta_4 = 3^\circ\ 51'\ 40.3''$

$\Delta_5 = 4^\circ\ 52'\ 11.73''$

$\Delta_6 = 5^\circ\ 52'\ 43.26''$

$\Delta_7 = 6^\circ\ 53'\ 14.76''$

$\Delta_8 = 7^\circ\ 53'\ 98.22''$

$\Delta_9 = 8^\circ\ 54'\ 19.7''$

$\Delta_{10} = 9^\circ\ 54'\ 51.18''$

$\Delta_{11} = 10^\circ\ 56'\ 32.34''$

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Check $\phi/_2 = \frac{20^\circ 40'}{2}$

$$= 10^\circ 20'$$

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Q3 Two tangents AB and BC are intersected by line K.M - - - - - - - - m.

Given data:-

$\Delta AKM = 130^\circ$
$\Delta KMC = 140^\circ$

1st arc radius = (7666 - 300) = **7366m**
2nd arc radius = (7666 - 200) = **7466m**

Chainage Intersection point = (7666 - 400)
= **7266 m**

Req:-
Tangent point = ?
Compound Curvature = ?

Sol:-

$K = 180^\circ - 130^\circ = \boxed{50^\circ}$
$\beta = 180^\circ - 140^\circ = \boxed{40^\circ}$

$\phi = K + \beta = \boxed{90^\circ}$
$I = 180 - \phi = 180^\circ - 90^\circ = \boxed{90^\circ}$

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Pg(40)

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

$$= 7366 \tan\left(\frac{50^\circ}{2}\right)$$

$$\boxed{KT_1 = KN = 3434.82\ m}$$

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

$$= 7466 \tan\left(\frac{40^\circ}{2}\right)$$

$$\boxed{MT_2 = MN = 2717.40\ m}$$

$$KM = MT_2 + KT_1 = 3434.82 + 2717.40$$

$$\boxed{KM \Rightarrow 6152.22\ m}$$

Now

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

$$BK = \frac{MK \sin\beta}{\sin I} = \frac{6152.22 \times \sin 40^\circ}{\sin 90}$$

$$\boxed{BK \Rightarrow 3954.57\ m}$$

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

$$\Rightarrow \frac{6152.22 \times \sin 50^\circ}{\sin 90^\circ} \Rightarrow 4712.87m$$

BM = 4719.87m

$T_L = IKT_1 + BK = 3434.82 + 3954.47$

$(T_L = 8880.27m)$ **$T_L \Rightarrow 7389.39m$**

$T_S = MT_2 + BM \Rightarrow 2717.40 + 4719.87$

$T_S \Rightarrow 7430.27$

$$L_L = \frac{\pi R_1 \alpha}{180} = \frac{\pi \times 7366 \times 50^\circ}{180^\circ} = 6428.04m$$

$$L_S = \frac{\pi R_2 \beta}{180} = \frac{\pi \times 7466 \times 40^\circ}{180} = 5212.25m$$

Chainage of Intersection Point

$\Rightarrow$ **7266m**

Chainage of intersection point

$-T_L = -7389.39$

So

$7266 - 7389.59 \Rightarrow -123.39$

Chainge of T_1 = -123.39m

Now by adding $L = 6428.04$
with -123.39

So
$-123.39 + 6428.04 \Rightarrow$ **6304.65 m**

Chainage of Compound Curvative

$\Rightarrow$ Plus $L_S = 5212.25m$

So
Chainage of $T_2 = 6304.65 + 5212.25$

$T_2 \Rightarrow 11516.9$ m