DEPTT: "CIVIL ENGINEERING"

EXAM:

Mid term

NAME:

MUHAMMAD ILYAS

ID :

"7956"

SEMESTER:

4th

SECTION:

"B"

No. of Pages:

"14"

SUBJECT:

Advanced Engineering Surveging

SUBMITTED TO:

"ENGR; Sir Abdul Farhan"

## Q:No: 1 PART (A)

## Solution:

Given data:

Deflection of Angle = 14° 13" 23"

Degree of curve = 5°

ID = 7956

Required:

Length of Long Cord?

Mid ordinate and external distance?

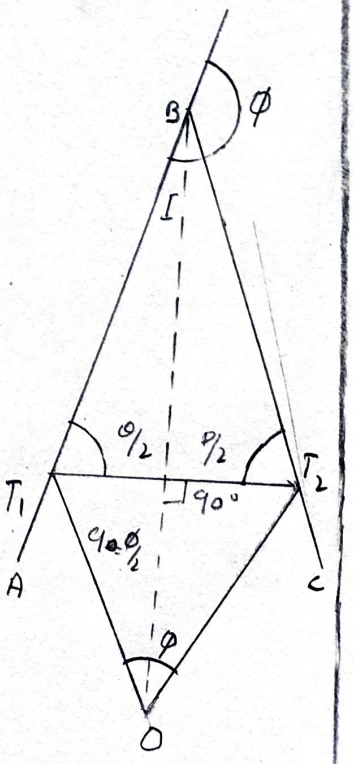
Chainage at the begining and end of the curve.?

## Calculations:

Degree of curve = 5°

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

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



Now to find tangent length:

$$BT_1 = BT_2$$

$$BT_1 = BT_2 = R \tan(\Phi/2)$$

$$BT_1 = BT_2 = 1145.916 \times \tan\left(\frac{14°.13'.23''}{2}\right)$$

$$\boxed{BT_1 = BT_2 = 142.966 \text{ feet}}$$

CURVE LENGTH:

$$L = \frac{\pi R \Phi}{180°}$$

$$L = \frac{(3.14)(1145.916)(14°.13'.23'')}{180°}$$

$$\boxed{L = 284.32 \text{ feet}}$$

CHAINAGE AT INTERSECTION POINT:

$$T_1 = 7956 - 142.966$$

$$\boxed{T_1 = 7813.034 \text{ feet}}$$

$$T_2 = 7813.034 + 284.32$$

$$\boxed{T_2 = 8097.354 \text{ feet}}$$

## LENGTH OF CHORD:

$$l = 2R \sin(\Delta/2)$$

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

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

$$\boxed{l = 281.9 \text{ feet}}$$

## MID ORDINATE:

$$EF = R\left[1 - \cos(\Delta/2)\right]$$

$$EF = (1145.916)\left[1 - \cos\left(\frac{14°.13'.23''}{2}\right)\right]$$

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

$$\boxed{EF = 9.17 \text{ feet}}$$

## EXTERNAL DISTANCE:

$$BF = R\left[\frac{1}{\cos(\Delta/2)} - 1\right]$$

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

$$BF = 1145.916\,(1.0077 - 1)$$

$$\boxed{BF = 8.82 \text{ feet}}$$

# Q: No: 1 PART (B)

## Solution:

B = 30 m

ID = 7956

| Chainage (m) | 0 | 30 | 60 | 90 | 120 | 150 |
|---|---|---|---|---|---|---|
| OFFset (m) | $\frac{7956}{1000}$ = 7.956 | 7.956+3 = 10.956 | 7.956+4 = 11.956 | 7.956-2 = 5.956 | 7.956-4 = 3.956 | 7.956-3 = 4.956 |

| Offset No. | Offset | Simpson's multiplier | Product |
|---|---|---|---|
| 1 | 7.956 | 1 | 7.956 |
| 2 | 10.956 | 4 | 43.82 |
| 3 | 11.956 | 2 | 23.91 |
| 4 | 5.956 | 4 | 23.82 |
| 5 | 3.956 | 1 | 3.956 |
| | | | $\Sigma$ = 103.46 → 103.46 |

Area $(h_1 - h_5) = \frac{30}{3}(103.46) =$ **1034.6 m²**

Area $(h_5 - h_6) = \frac{30}{2}(3.956 + 4.956)$

$= 133.68\ m^2$

Total area = 133.68 + 1034.6 = **1168.28 m²**

## Q: No # 2

→ First we will assume the radius, then it will be equals to ID - 7050.

Given data:

ID = 7956

$R = 7956 - 7050 = 906\ m$

Deflection angle = $20° 40'$

Peg interval = 20 m

Chainage at intersection point, which also be assumed = (ID - 4050) = 7956 − 4050 = 3906 m

Chainage = 3906 m

**Calculations:**

Now to find tangent length.

$BT_1 = BT_2 = R \tan(\Delta/2)$

$BT_1 = BT_2 = 906 \tan\left(\frac{20° 40°}{2}\right)$

$\boxed{BT_1 = BT_2 = 165.2\ m}$

## LENGTH OF CURVE:

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

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

$$\boxed{L = 326.629 m}$$

## Chainage:

$$T_1 = 3906 - 165.20$$

$$\boxed{T_1 = 3740.80 m}$$

$$T_2 = 3740.80 + 326.629$$

$$\boxed{T_2 = 4067.429 m}$$

## Now

Length of 1st sub-Cord = 3775 − 3740.80

$$C_1 = \boxed{34.20 m}$$

Length of last Sub-Cord = 4067.429 − 4040

$$\boxed{C_{15} = 27.429 m}$$

As we know that

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

$$C_{12} = C_{13} = C_{14} = C_{15} = 20\ m$$

**Now:**

$$\text{No. of cords} = \frac{\text{Length of curve}}{\text{Peg interval}} - C1$$

$$= \frac{326.629 - 19.20}{20}$$

$$= (15.37),\ \text{so it is nearly to 15 cords, then we have no. of cords} = 15$$

**Deflection Angle:**

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

$$\delta_1 = \frac{1718.9 \times 34.20}{60(906)}$$

$$\delta_1 = 1^\circ 4' 52''$$

$$\delta_2 = \frac{1718.9 \times 20}{60(906)}$$

$$\delta_2 = 0^\circ 37' 57''$$

Then,

$$\delta_2 = \delta_3 = \delta_4 \text{ ---------- } \delta_{14} = 0^\circ 37' 57''$$

$$\delta_{14} = \frac{1718.9 \times 27.429}{60(906)}$$

$$\delta_{14} = 0^\circ 52^\circ, 48''$$

Total deflection angle for the cords are;

$$D_1 = \delta_1 = 1^\circ 4' 52''$$

$$D_2 = \delta_1 + \delta_2 = D + \delta_2 = 1^\circ 42' 4857''$$

$$D_3 = D_2 + \delta_3 = 2^\circ 20' 45.38''$$

$$D_4 = D_3 + \delta_4 = 2^\circ 58' 42.07''$$

$$D_5 = D_4 + \delta_5 = 3^\circ 36' 38.76''$$

$$D_6 = D_5 + \delta_6 = 4^\circ 14' 35.45''$$

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

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

$\Delta_9 = \Delta_8 + \delta_9 = 6^\circ\ 8'\ 25.52''$

$\Delta_{10} = \Delta_9 + \delta_{10} = 6^\circ\ 46'\ 28.9''$

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

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

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

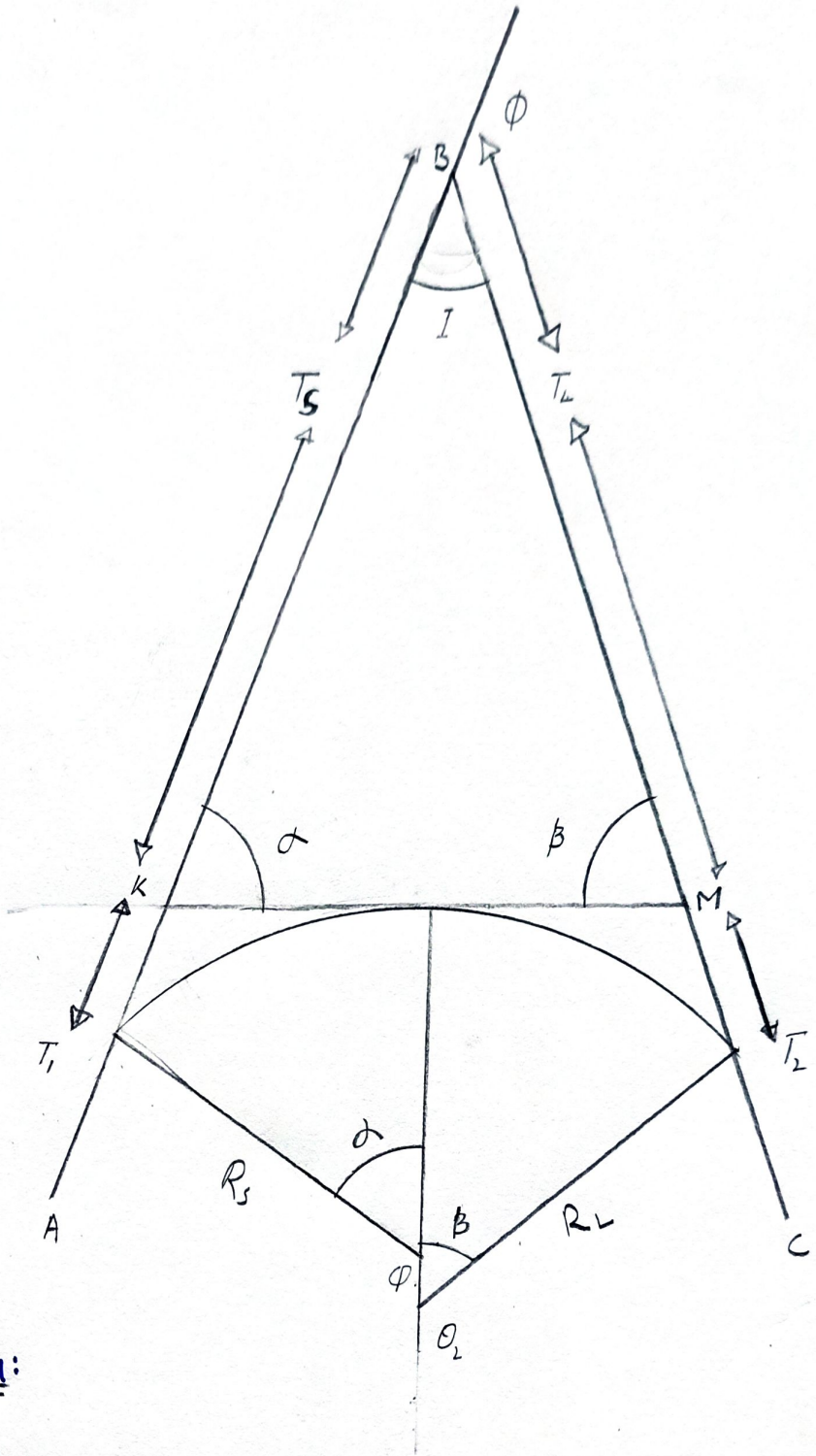
$\Delta_{14} = \Delta_{13} + \delta_{14} = 9^\circ\ 18'\ 8.97''$

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

$$\text{Check} = \phi/2 = \frac{20^\circ\ 40''}{2} = 10^\circ\ 11'\ 10''$$

# Q:No: 3

Diagram:




## Given data:

$\Delta AKM = \alpha = -130° + 180° = 50°$

$\Delta KCM = \beta = -140° + 180° = 40°$

Radius $= R_1 = 7956 - 300 = 7656$ m

Radius $= R_2 = 7956 - 200 = 7756$ m

Chainage at B point $= 7956 - 400 = 7556$ m

**Required:**

Chainage of tangent points?

Compound points?

**Calculations:**

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

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

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

$$= 7656 \tan\left(\frac{50}{2}\right)$$

$$= 3570.051 \text{ m}$$

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

$$= 7756 \tan(40/2)$$

$$= 2822.953 \text{ m}$$

$$KM = MT_2 + KT_1 = 3570.051 + 2822.953$$

$$= 6393.004 \text{ m}$$

$\Delta BKM$ By Sin rule

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

$$BK = \frac{(6393.004) \sin (40°)}{\sin (90°)}$$

$$\boxed{BK = 4109.343\ m}$$

We have

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

$$BM = \frac{(6393.004) \sin (50)}{\sin (90)}$$

$$\boxed{BM = 4897.33 m}$$

~~BM = 4110.9~~

$$\rightarrow T_L = KT_1 + BK$$

$$= 3570.051 + 4109.343$$

$$\boxed{= 7679.343\ m}$$

→ $T_s = MT_2 + BM$

$= 2822.953 + 4897.33$

$= 7720.283\ m$

→ $L_L = \frac{\pi R_1 \alpha}{180^\circ}$

$L_L = \left[\frac{(3.14)(7656)(50^\circ)}{(180^\circ)}\right]$

$L_L = 6677.73\ m$

→ $L_S = \frac{\pi R_2 B}{180^\circ}$

$L_S = \left[\frac{(3.14)(7756)(40^\circ)}{(180^\circ)}\right]$

$L_S = 5411.964\ m$

→ Chainage of the begining of the curve $T_1$

= Chainage at intersection point − $T_L$

= 7556 − 7679.343

= − 123.343 m

Plus $L_L$ = − 123.343 + 6677.73

= 6554.39 m

Chainage of Compound curve:

Plus $L_S$ = 6554.39 + 5411.964

Chainage $T_2$ = 11966.354 m