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ID : 7976

SEC : "B"

DEPT: BE Civil

SUBJECT:- Advance Engg. Survey.

QUES No # 01 (a):

Two tangents meet at a chainage of (1D) ft with the deflection angle of 14° 13' 23". Degree of curve is 5°.

Calculate:

1) Chainage of the beginning and end of the curve.
2) Length of long chord.
3) Mid ordinate & external distance.

Given data:-

Tangent meet at chainage = 7976 ft.

Deflection angle = 14° 13' 23"

Degree of curve = 5°

Solution:-

$D = 5°$

$R = 5729.58 / D$

$R = 5729.58 / 5°$

$R = 1145.91$ ft.

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

$BT_1 = BT_2 = 1145.91 \tan\left(\frac{14° 13' 23''}{2}\right)$

$BT_1 = BT_2 = 142.96$ ft.

Length of curve:-

$L = \frac{\pi R \phi}{180}$

$L = \frac{3.14 \times 1145.91 \times 14°13'23''}{180°}$

$L = 284.45$ ft.

chainage of intersection point = 7976 m.

minus tangent length = - 142.96 ft.

chainage of $T_1$ = 7833.04 ft.

plus $L$ = 284.45 ft.

chainage of $T_2$ = 8117.49 ft.

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

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

$$l = 283.72 \text{ ft.}$$

**Mid ordinate:**

$$= R\left(1 - \cos \phi/2\right)$$

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

$$= 8.81 \text{ ft.}$$

**External distance:**

$$= R\left[\sec\left(\phi/2\right) - 1\right]$$

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

$$= 8.88 \text{ ft.}$$

QUES No # 1 (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 ID ÷ 1000. For example if some one having ID 7932, then his/her first offsect will be 7.932 and so on.

| offset No | offsets | Simpson's multiplier | Product: |
|---|---|---|---|
| 1 | 7.976 | 1 | 7.976 |
| 2 | 10.976 | 4 | 43.904 |
| 3 | 11.976 | 2 | 23.952 |
| 4 | 5.976 | 4 | 23.904 |
| 5 | 3.976 | 1 | 3.976 |
| [illegible] | [illegible] | [illegible] | Σ = 103.712 |

(5)

Area $(h_1 - h_5) = \frac{b}{3} \times 103.712$

$= \frac{30}{3} \times 103.712.$

$= 10 \times 103.712$

$= 1037.12\ m^2$

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

$= \frac{30}{2}(3.976 + 4.976)$

$= 134.28\ m^2$

Total area = $1037.12 + 134.28$

$= 1171.4\ m^2$

Total area = $1171.4\ m^2$

Ques # 02:

A circular curve of radius (7976 - 200) deflecting right through 20°.40', is to be set out between two straights having chainage of the point of intersection as (7976 - 400) m.

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

Given data:-

Circular radius = 7976 - 7692 = 284m.

Deflection angle = 20° 40'

Point of intersection = 7976 - 5429 = 2547m

Interval = 20m.

Solution:-

$R = 284 \times 2 = 568$

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

Putting values.

(7)

$BT_1 = BT_2 = 568 \tan \frac{20^\circ 40'}{2}$

$BT_1 = BT_2 = 103.56\,m.$

Length of curve $= L = \frac{RR\emptyset}{180}$

$L = \frac{3.14 \times 568 \times 20^\circ 40'}{180^\circ}$

$L = 204.87\,m.$

=> chainage of point of intersection
$= 2547\,m.$

minus tangent $= -103.56$

chainage of $T_1 = 2443.44.$

Plus $L = +\ 204.87.$

chainage of $T_2 = 2648.31\,m.$

Length of 1st chord $= C_1$
$= 2460 - 2443.44$
$= 16.56\,m.$

$C_2 = C_3 = C_4 = C_5 = C_6 = C_7 = C_8 = C_9$.

and

$$C_{11} = 2648.40 - 2630$$
$$= 18.40 \text{ m.}$$

**By deflection method:-**

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

$$\delta_1 = \frac{1718.9 \times 16.56}{60 \times 568.}$$

$$\delta_1 = 0^\circ 50' 6.86''$$

and:- $$\delta_2 = \frac{1718.9 \times 20}{60 \times 568}$$

$$\delta_2 = 1^\circ 0' 31.48''$$

$$\delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_8 = \delta_9 = \delta_{10}$$

and $$\delta_{11} = \frac{1718.9 \times 18.40}{60 \times 568}$$

$$\delta_{11} = 0^\circ 55' 40.96''$$

Total deflection (tangential) angle for the chord is :-

$\Delta_1 = \delta_1 = 0^\circ 55' 6.86''$

$\Delta_2 = \delta_1 + \delta_2 = 0^\circ 55' 6.86'' + 1^\circ 0' 31.48''$

$\Delta_2 = 1^\circ 50' 38.34''$

$\Delta_3 = 2^\circ 51' 9.82''$

$\Delta_4 = 3^\circ 51' 41.3''$

$\Delta_5 = 4^\circ 52' 12.78''$

$\Delta_6 = 5^\circ 52' 44.26''$

$\Delta_7 = 6^\circ 53' 15.74''$

$\Delta_8 = 7^\circ 53' 47.22''$

$\Delta_9 = 8^\circ 54' 18.7''$

$\Delta_{10} = 9^\circ 54' 50.18''$

$\Delta_{11} = 10^\circ 50' 31.34''$

## QUES NO # 03

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

### GIVEN DATA:-

$\Delta AKM = 130^\circ$

$\Delta KMC = 140^\circ$

1st arc radius = (7976 - 300) = 7676m.

2nd arc radius = (7976 - 200) = 7776m.

chainage of intersection print = (7976 - 400)
= 7576m.

### Required data:-

Tangent point = ?

compound curvature = ?

**Solution:-**

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

$$\alpha = 50^\circ$$

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

$$\beta = 40^\circ$$

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

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

$$KT_1 = KN = R_L \tan(\alpha/2).$$

$$= 7676 \tan(50^\circ/2).$$

$$KT_1 = KN = 3579.37m$$

$$MN = MT_2 = R_S \tan(\beta/2).$$

$$= 7776 \tan(40^\circ/2)$$

$$MN = MT_2 = 2830.23m.$$

$$KM = MT_2 + KT_1 = 2830.23 + 3579.37$$

$$KM = 6409.6m$$

**Now:-**

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

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

$$BK = \frac{6409.6 \times \sin(40^\circ)}{\sin 90^\circ} \qquad \therefore \sin 90^\circ = 1$$

$$BK = 4120.01 m.$$

**Now:-**

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

$$BM = \frac{6409.6 \times \sin(50^\circ)}{\sin 90^\circ}$$

$$BM = 4910.03 m.$$

**So:-**

$$T_L = KT_1 + BK = 3579.37 + 4120.01$$

$$T_L = 7699.38 m.$$

$$T_S = MT_2 + BM = 2830.23 + 4910.03$$

$$T_S = 7740.26 m.$$

$$L_L = \frac{\pi R_L \alpha}{180} = \frac{3.14 \times 7676 \times 50}{180}$$

$L_L = 6695.17\,m.$

$$L_S = \frac{\pi R_S \beta}{180} = \frac{3.14 \times 7776 \times 40}{180}$$

$L_S = 5426\,m.$

chainage of intersection point = 7576m.

$-T_L = -7699.38\,m.$

chainage of $T_L = -123.38m.$

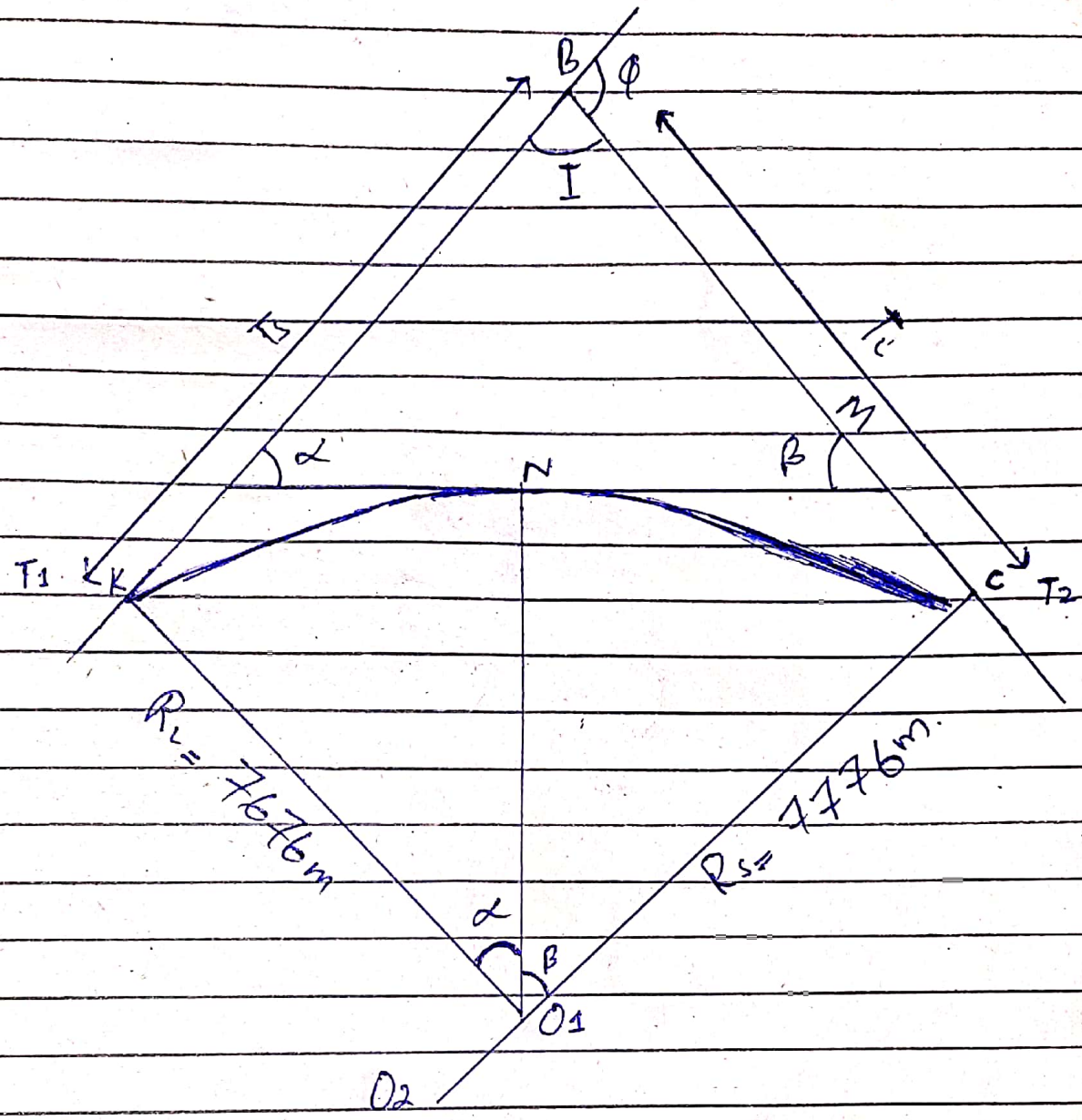
plus $L = +\ 6683.83m.$

$= 6560.45m.$

**Chainage of compound curvature:**

(N) plus $L_S = 5426\,m.$

chainage of $T_2 = 11986.45m.$


B
φ
I
α
N
β
M
T1
K
C
T2
R1 = 7676m
R2 = 7776m
α
β
O1
O2