Assigment / Quiz

ID # 7510

Question # 1 (a)

Part (a)

Two chainage meets at a chainage of (I.D) ft. . . . .

Calculate

① Chainage at the beginning and and of the Curve.

② Length of long Chord.

③ Mid ordinate and external distance.

Given data:

Target meet at Chainage = 7510 ft

Deflection angle = $14^\circ 13' 23''$

Degree of Curve = 5°

Sol:-

$D = 5^\circ$

$R = 5729.58 / D$

$5729.58 / 5^\circ$

$= 1145.91$ ft

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

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

$BT_1 = BT_2 = 142.96\ ft$

Length of Curve

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

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

$L = 284.45\ ft$

Chainage of intersection point = 7510

Minus tangent length = $-142.96\ ft$

Chainage of $T_1 = 7367.04$

Plus $L = 284.45\ ft$

Chainage of $T_2 = 7794.45\ ft$

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

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

$= 283.72\ ft$

Mid Ordinate:

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

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

$$= 8.81 \text{ ft}$$

External Distance

$$R\left(\sec\left(\frac{\Delta}{2}\right)-1\right)$$

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

$$= 8.88 \text{ ft}$$

Q#1 (b)

Find the area from the data - - — — ... and so on.

Sol:-

offset No	Offset	Simpson multiplier	Product
1	7.510	1	7.510
2	10.51	4	42.04
3	11.51	2	23.02
4	5.51	4	22.04
5	3.51	2	7.02
6	4.51	1	4.51

$\Sigma = 106.14$

$= \text{Area } (h_1 - h_6)$

$= \frac{b}{3} \times 106.14$

$= \frac{30}{3} \times 106.14$

$= 1061.4 \text{ m}^2$

Total Area $= 1061.4 \text{ m}^2$

Question #2

A Circular curve of radius (1D - 200m). ..... Peg interval 20m.

Given data:

Radius = 1D - 200 = 7510 - 200 = 7310

$\emptyset = 20^\circ 40'$

Chainage of B = 1D - 400 = 7110

Peg interval = 20m

Required: Deflection Angle = ?

Sol:-

Tangent length = $BT_1 = BT_2$

$= R \tan \frac{\emptyset}{2}$

$= 7310 \tan \frac{20^\circ 40'}{2}$

$= 1369.92 m$

Length of Curve $= L = 1R \times \frac{\emptyset}{180^\circ}$

$$L = 3.14 \times 7510 \times \frac{20^\circ 40'}{180}$$

$$L = 2707.49\,m$$

Chainage of T_1 = Chainage of B–BT_1

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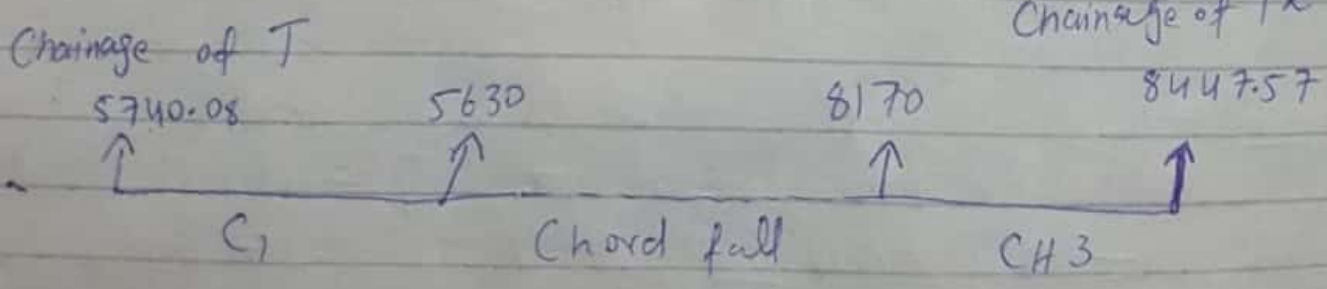
$$7110 - 1369.92 = 5740.08\,m$$

Chainage of T_2 = Chainage of $T_1 + L$

$$5740.08 + 2707.49 = 8447.57\,m$$



$$\theta_1 = \frac{1718.91 \times C_1}{60 \times R} = \frac{1718.91 \times 13.92}{60 \times 7510} = 0^\circ 3' 11.16''$$

$$\theta_2 - \theta_{12} \quad \frac{1718.91 \times C_2}{60 \times R} = \frac{1718.91 \times 20}{60 \times 7510} = 0^\circ 4' 34.66''$$

$$\delta_3 = \frac{1718.91 \times CH_3}{60 \times R} = \frac{1718.91 \times 10.44}{60 \times 7510} = 0^\circ 2' 23.37''$$

Deflection Angle:-

$$\Delta_1 = \delta_1 = 0^\circ 3' 11.16''$$

$$\Delta_2 = \Delta_1 + \delta_2 = 0^\circ 3' 11.16'' + 0^\circ 4' 34.66''$$

$$\Delta_2 = 0^\circ 7' 45.82''$$

$$\Delta_3 = \Delta_2 + \delta_3 = 0^\circ 10' 9.19''$$

$$\Delta_4 = \Delta_3 + \delta_4 = 0^\circ 12' 32.56''$$

$$\Delta_5 = \Delta_4 + \delta_5 = 0^\circ 14' 55.93''$$

$$\Delta_6 = \Delta_5 + \delta_6 = 0^\circ 17' 19.3''$$

$$\Delta_7 = \Delta_6 + \delta_7 = 0^\circ 19' 42.67''$$

$$\Delta_8 = \Delta_7 + \delta_8 = 0^\circ 22' 6.04''$$

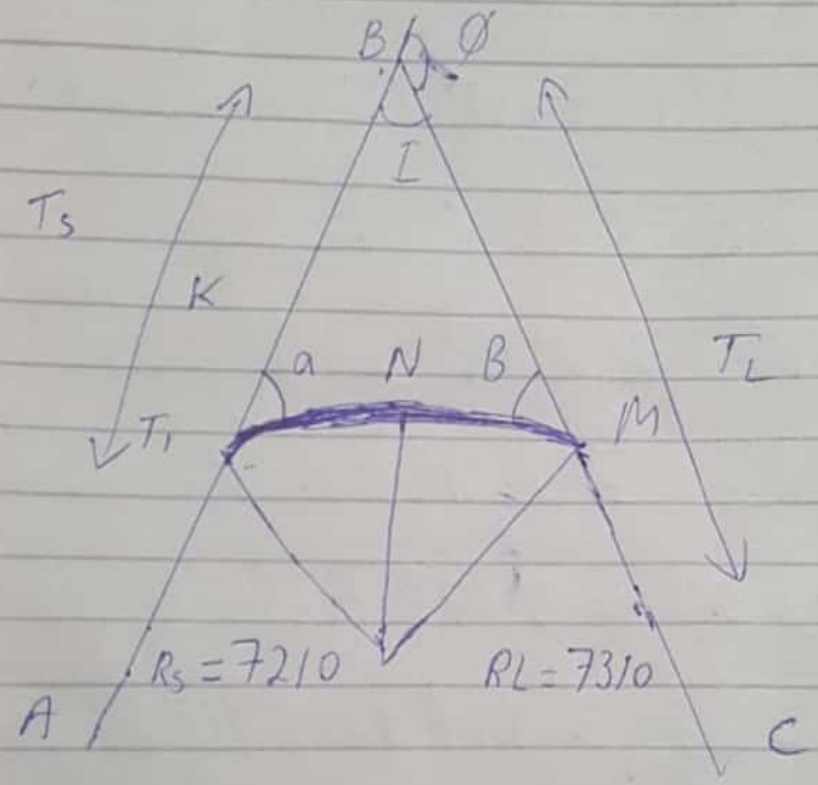
$$\Delta_9 = \Delta_8 + \delta_9 = 0^\circ 24' 29.41''$$

$$\Delta_{10} = \Delta_9 + \delta_{10} = 0^\circ 26' 52.78''$$

And So on- - - - -

Question #3

Two tangent AB & BC ..... (10-400) m.



Sol:-

$$a = 180^\circ - 130^\circ = 50^\circ$$

$$\beta = 180^\circ - 140^\circ = 40^\circ$$

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

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

$$KT_1 = kN = R_L \tan\left(\frac{\beta}{2}\right) = 7310 \tan\left(\frac{40}{2}\right)$$

$$KT_1 = kN = 2660.62 \text{ m}$$

$$MN = MT_2 = Rs \tan\left(\frac{\alpha}{2}\right)$$

$$= 7210 \tan\left(\frac{50}{2}\right)$$

$MN = MT^2 = 3270.21\,m$

$KM = MT^2 + MN = 2660.62 + 3270.21$

$= 5930.83$

$\boxed{KM = 5930.83}$

find ΔBKM by Sin Rule.

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

$$BK = \frac{MK \sin\beta}{\sin I} = \frac{5930.83 \times \sin 40^\circ}{\sin(90^\circ)}$$

$BK = 3812.26\,m$

$$BM = \frac{MK \sin\alpha}{\sin I} = \frac{5930.83 \times \sin 50^\circ}{\sin 90^\circ}$$

$BM = 4543.27$

$T_L = kT_1 + BK = 2660.60 + 3812.26 = 30472.86m$

$T_S = MT_2 + BM = 3270.21 + 4543.27 = 7813.48m$

$L_L = \frac{\pi R_L \beta}{180^\circ} = \frac{3.14 \times 7310 \times 40^\circ}{180^\circ}$

$L_L = 5100.75\ m$

$L_S = \frac{\pi R_S \alpha}{180^\circ} = \frac{3.14 \times 7210 \times 50^\circ}{180^\circ}$

$L_S = 6288.72\ m$

Chainage of Intersection point = 7510 − 400
= 7110 m

Minus T_S = 7110 − 7813 = 703 m

Chainage of T_1 = 703 m

Plus LS = 703 + 6288.72 = 6991.72 m

Chainage of Compound N = 6991.72 m

Plus L_L = 6991.72 + 5100.75

Chainage of T_2 = 12092.47