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section A semester 4
civil engineering

Q NO 1

Q 018

$D = 5°$

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

$= \frac{5729.58}{5}$

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

$= 1145.91$

Tangent length $= BT = BI_2 = R \tan\left(\frac{I}{2}\right)$

$BI_1 = BI_2 = 1145.91 \times \tan\left(\frac{14° 13' 23''}{2}\right)$

$BT = BI_2 = 142.96 ft$

length of curve:

$L = \frac{\pi R D}{180°}$

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

$L = 284.45 ft$

chainage of intersection Point = 7927

Minus tangent length =

chainage of $\widehat{T_1}$ =

Plus L =

Chain of $\widehat{T_2}$ =

length of chord = I

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

$$2 \times 1145.9 \times \sin\left(\frac{14^\circ\ 13'\ 23''}{2}\right)$$

$$= 283.72 ft$$

Mid ordinate:

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

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

$$= 8.81 ft$$

External distance:

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

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

$$= 8.88 ft$$

Q NO 2

chainage (m)	0	30	60	90	120	150
offset (m)	7.927	7.927+3 = 10.927	7.927+4 = 11.927	7.927-2 = 5.927	7.927 = 3.927	7.927 = 4.927

As we know from the question

b = 30m

So we can find the area

$$\text{Area} = \frac{b}{3}\left(7.927 + 3.927 + 2(11.927) + 4(10.927) + 4(5.927) + \frac{(3.927 + 4.927)}{2}\right) b$$

b = 30

Area =

2167.26

Q NO 2

circular radius = 7927 - 7647
Assume value = 7647
= 280m

Deflection angle = 20°40'

Point of intersection = 7927 - 5494
Assume value = 2433 m

Interval = 20m

Sol:

$R = 280 \times 2 = 560m$

$BT_1 = BT_2 = R \tan \frac{\Phi}{2}$

$BT_1 = BT_2 = 560 \tan \frac{20^\circ 40'}{2}$

$\Rightarrow 102.10 m$

Length of Curve:

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

$L = \frac{\pi 560\, 20^\circ 40'}{180}$

$L = 201.70m$

Chainage of point of intersection = 2433m
Minus Transent = -102.10
Chainage of T_1 = 2330.9m
Plus L = 201.70
Chainage of T_2 = 2532.6m
Length of 1st chord = C_1
Assume value = 2345

$\Rightarrow 2345 - 2330.9$

$C_1 = 14.1m$

$C_2 = C_3 = C_4 = C_5 = C_6 = C_7 = C_8 = C_9 = C_{10} = 20m$

$C_{11} = 25.32\,C - 2515$

$C_{11} = 176\,m$

By deflection method

$$S_1 = \frac{1718.9 \times C_1}{60R}$$

$$\Rightarrow \frac{1718.9 \times 14.1}{60 \times 560}$$

$S_1 = 0°43'16.77''$

$$S_2 = \frac{1718.9 \times 20}{60 \times 560}$$

$S_2 = 1°1'23.36''$

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

$$S_{11} = \frac{1718.9 \times 17.6}{60 \times 560}$$

$= 0°54'1.35''$

Total deflection (tangential) angle for the chord is,

$\Delta_1 = S_1 = .0°43'16.77''$

$\Delta_2 = S_1 + S_2 = 0°43'16.77'' + 1°1'23.36''$

$\Rightarrow 1°44'40.13''$

$\Delta_3 = 2°46'3.49''$

$\Delta_4 = 3°47'26.85''$

$\Delta_5 = 4°48'50.21''$

$\Delta_6 = 5°50'13.57''$

$\Delta_7 = 6°51'36.93''$

$\Delta_8 = 7°53'0.29''$

$\Delta_9 = 8°54'23.65''$

$\Delta_{10} = 9°55'47.01''$

$\Delta_{11} = 10°57'10.37''$

Check $\frac{\Phi}{2} = \frac{20°40'}{2}$

$= 10°20'$

Q NO 38

Sol: 7927

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

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

$\Phi = \alpha + \beta \Rightarrow 90^\circ$

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

$KT_1 = KN = RS \left(\tan\left(\frac{\Phi}{2}\right)\right) \Rightarrow (1)$

1st arc is given (10 - 3002)

$= 7595$

$KN = RS \tan\left(\frac{\alpha}{2}\right) \Rightarrow 7595 \tan\left(\frac{50}{2}\right)$

$KT_1 = KN \Rightarrow 3541.60m$

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

2nd Arc is given

$(10 - 200)m$

$= 7727m$

Put in equ (ii)

$MT_2 = MN =$ [redacted] $2800.75 + 3541.60$

$Km = 6342.35m$

find ΔBKM, by sin rule

$\frac{BK}{\sin B} = \frac{KM}{\sin(I)}$

$BK = 4076.78$

$BM = \frac{Km \times \sin\alpha}{\sin(I)} = \frac{6342.35 \times \sin 50}{\sin 90}$

$BM = 4958.42m$

$\bar{T}_L = K\bar{T}_1 + BK = 3[91.60 + 4076.7$

$\bar{T}_L = 7618.38m$

$\bar{T}_3 = M_2 + B =$

$2800 + 4818.42$

$R = 7659.17$

$L_3 = \frac{\pi R S \alpha}{180} = \frac{\pi \times 7659 \times \alpha}{180^\circ}$

$L_3 = 6627.88m$

$\frac{L_2 \pi R L B}{180} = \frac{\pi \times 7695 \times 40}{180^\circ}$

$L_2 = 53.69.4m$

Chainage of intersection:

Point = (ID - 400)

$= 7527m$

chainage of intersection Point - T_L

$= 7527$

$- 91.38$

Plus $\hat{P} = -91.38 + 6827.88$

$= 6718.26$

chainage of compound curvature (CT) Plus L_2

$\Rightarrow \bar{T}_2 = 12097.56$