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Subject: Advanced Engineering Survey

ID # 7677

Assignment # 01

Department: Civil Engineering

IQRA NATIONAL UNIVERSITY

PESHAWAR.

Q01 Part A Two tangent meet at a chainage of (7677) ft with the deflection angle of $14°13'23''$. Degree of curve is $5°$

calculate

(i) Chainage at the beginning & end of the curve

(ii) Length of long chord

(iii) Mid ordinate & External distance.

Sol

Interchainage = 7677 ft

Degree of curve = $5°$.

$\phi = 14°13'23''$

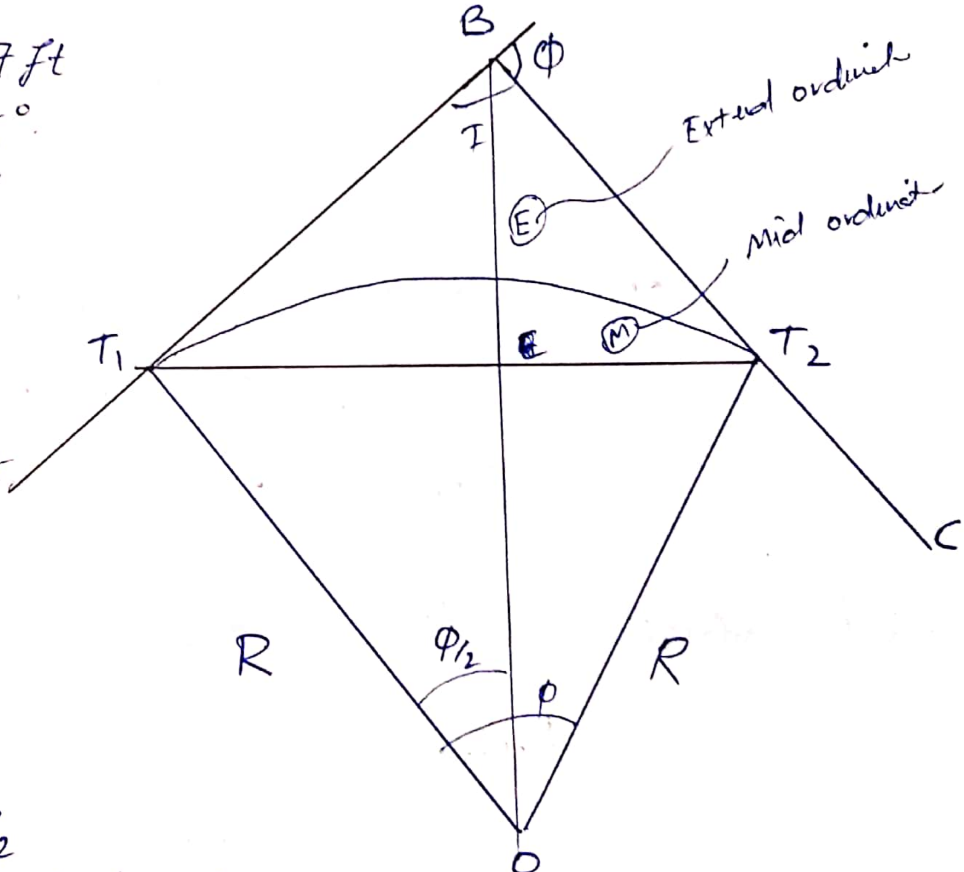
First Find Ridus

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

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

$R = 1145.9$

$\boxed{R \simeq 1146\ ft}$



Tangent lengths

$BT_1 = R \tan \phi/2$

$BT_1 = 1146 \tan\left(\frac{14°13'23''}{2}\right)$

$\boxed{BT_1 = 142.97\ ft}$

&

$\boxed{BT_2 = 142.97\ ft}$

Length of curve

$$L = \frac{\pi R \phi}{180} = \frac{3.14 \times 1146 \times (14^\circ 13' 23'')}{180}$$

$$\boxed{L = 284.33 \text{ ft}}$$

(i) chainge at the begaining & end of the curve.

chainage of T_1 = chainage of inter. − Tangent length BT_1

$$= 7677 - 142.97$$

$$\boxed{T_1 = 7534.03 \text{ ft}}$$

Chainage of T_2 = chainage of inter. + Tangent length BT_2

$$= 7677 + 142.97$$

$$\boxed{T_2 = 7819.97 \text{ ft}}$$

(ii) Length of long chord

$$L_{chord} = 2R \sin \phi/2$$

$$= 2 \times 1146 \times \sin\left(\frac{14^\circ 13' 23''}{2}\right)$$

$$\boxed{L_{chord} = 283.75 \text{ ft}}$$

(iii) External ~~ordinate~~ distance & Mid ordinate

External distance = $R\left(\frac{1}{\cos(\phi/2)} - 1\right)$

$= 1146\left(\frac{1}{\cos\left(\frac{14°13'23''}{2}\right)} - 1\right)$

$\boxed{\text{Ext. distance} = 8.88\ ft}$

Mid ordinate = $R(1 - \cos \phi/2)$

$= 1146\left(1 - \cos\left(\frac{14°13'23''}{2}\right)\right)$

$\boxed{\text{Mid ordinate} = 8.81}$

X ———————————— X

Part B

Find the area from the data obtained from chain survey, as shown in Table below. using simpson one third rule.

	x_0	x_1	x_2	x_3	x_4	x_5
Chainage (m) (x)	0	30	60	90	120	150
offset (fx)	7.677	10.677	11.677	5.677	3.677	4.677

Sol

By simpson 1/3 rule

$$\int_a^b (fx)\,dx = \frac{h}{3}\left(fx_0 + f(x_n)\right) + 2\left(f(x_2) + f(x_4) \cdots + 4\left(fx_1 + fx_3 + \cdots\right)\right.$$

So $a=0$ & $b=150$

$h=30$

$$\int_0^{15} (fx)\,dx = \frac{30}{3}\left(\left(7.677+4.677\right)+2\left(11.677+3.677\right)+4\left(10.677+5.677\right)\right\}$$

$$= 10\left[12.354+30.708+65.416\right]$$

$$\boxed{\text{Area} = 1084.78\ m^2}$$

Q2

Radius = (I.D - 200) m

$\theta = 20°40'$

intersection chainage = (ID - 400)

Peg interval = 20m

Sol

we suppose ID - 6500 For Radius

$R = 7677 - 6500$

$\boxed{R = 1177\ m}$

chainage of intersection = 7677 - 400

= 7277 m

Tangent $T_1 = R \tan\frac{\theta}{2} = 1177 \times \tan\left(\frac{20°40'}{2}\right)$

$\boxed{T_1 = 214.6\ m}$

$\boxed{T_2 = 214.6\ m}$

Length of curve $= L = \frac{\pi R \theta}{180°} = \frac{3.14 \times 1177 (20°40')}{180}$

$\boxed{L = 424.33\ m}$

chainage of T_1 = 7277 - 214.6

$\boxed{T_1 = 7062.4\ m}$

chainage of T_2 = 7277 + 214.6

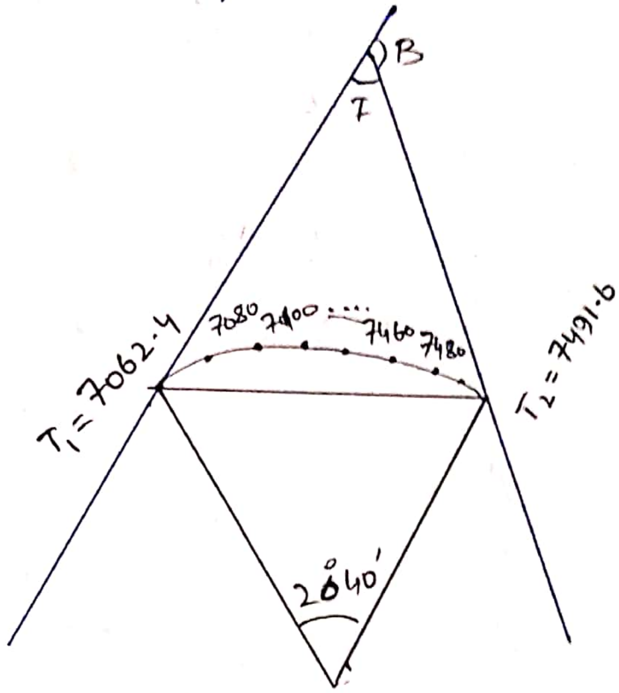
$\boxed{T_2 = 7491.6\ m}$

$C_1 = 17.6\,m$ ∵ $[7080 - 7062.4]$

$C_2 = C_3 = C_4 \ldots C_{18} = C_{19} = C_{20} = C_{21} = 20m$

$C = 7491.6 - 7480$

$C = 11.6m$



By deflection Method

$\delta_1 = \dfrac{1718.9 \times C_1}{60R}$ (degree)

$\delta_1 = \dfrac{1718.9 \times 17.6}{60 \times 1177}$

$\boxed{\delta_1 = 0°25'42.19''}$

$\delta_2 = \delta_3 \ldots \delta_{20} = \delta_{21} = \dfrac{1718.9 \times 20}{60 \times 1177} = \boxed{0°29'12.49''}$

$\delta_{22} = \dfrac{1718.9 \times 11.6}{60 \times 1177} = \boxed{0°16'56.44''}$

Total deflection (Tangential) angle For the chord

$\Delta_1 = \delta_1 = 0°25'42.19''$

$\Delta_2 = \Delta_1 + \delta_2 = 0°54'54.68''$

$\Delta_3 = \Delta_2 + \delta_3 = 1°24'7.17''$

$\Delta_4 = \Delta_3 + \delta_4 = 1°53'19.66''$

$\Delta_5 = \Delta_4 + \delta_5 = 2°22'32.15''$

$\Delta_6 = \Delta_5 + \delta_6 = 2^\circ 51' 44.64''$

$\Delta_7 = \Delta_6 + \delta_7 = 3^\circ 20' 57.13''$

$\Delta_8 = \Delta_7 + \delta_8 = 3^\circ 50' 9.62''$

$\Delta_9 = \Delta_8 + \delta_9 = 4^\circ 19' 22.11''$

$\Delta_{10} = \Delta_9 + \delta_{10} = 4^\circ 48' 34.6''$

$\Delta_{11} = \Delta_{10} + \delta_{11} = 5^\circ 17' 47.09''$

$\Delta_{12} = \Delta_{11} + \delta_{12} = 5^\circ 46' 59.58''$

$\Delta_{13} = \Delta_{12} + \delta_{13} = 6^\circ 16' 12.07''$

$\Delta_{14} = \Delta_{13} + \delta_{14} = 6^\circ 45' 24.56''$

$\Delta_{15} = \Delta_{14} + \delta_{15} = 7^\circ 14' 37.05''$

$\Delta_{16} = \Delta_{15} + \delta_{16} = 7^\circ 43' 49.54''$

$\Delta_{17} = \Delta_{16} + \delta_{17} = 8^\circ 13' 2.03''$

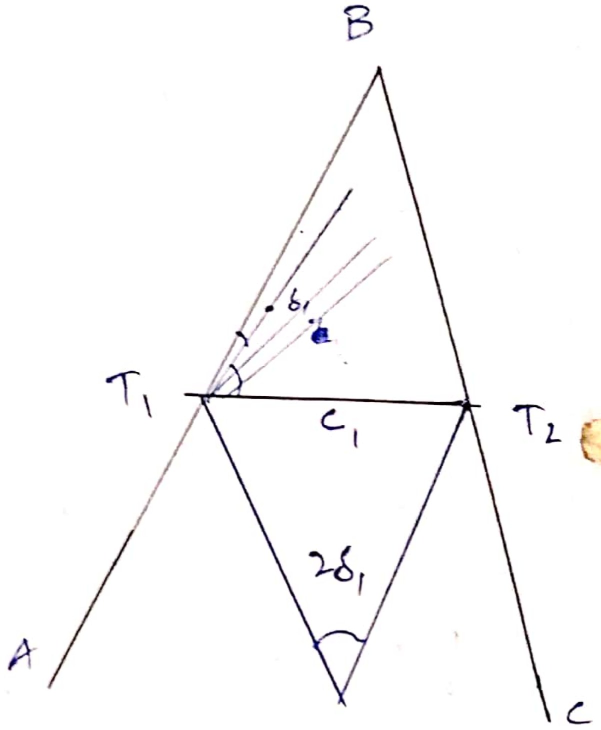
$\Delta_{18} = \Delta_{17} + \delta_{18} = 8^\circ 42' 14.52''$

$\Delta_{19} = \Delta_{18} + \delta_{19} = 9^\circ 11' 27.01''$

$\Delta_{20} = \Delta_{19} + \delta_{20} = 9^\circ 40' 39.5''$

$\Delta_{21} = \Delta_{20} + \delta_{21} = 10^\circ 9' 51.99''$

$\Delta_{22} = \Delta_{21} + \delta_{22} \quad 10^\circ 26' 48.43''$



$$\text{Check} = \frac{20^\circ 40'}{2}$$

$$\boxed{= 10^\circ 20'}$$

X ——— X

Q3 Given Data

$\Delta AKM = 130^\circ$

$\Delta KMC = 140^\circ$

1st arc radius $= (7677 - 5000)$

suppose it

$\boxed{R_s = 2677\,m}$

$R_L = 7677 - 4000$

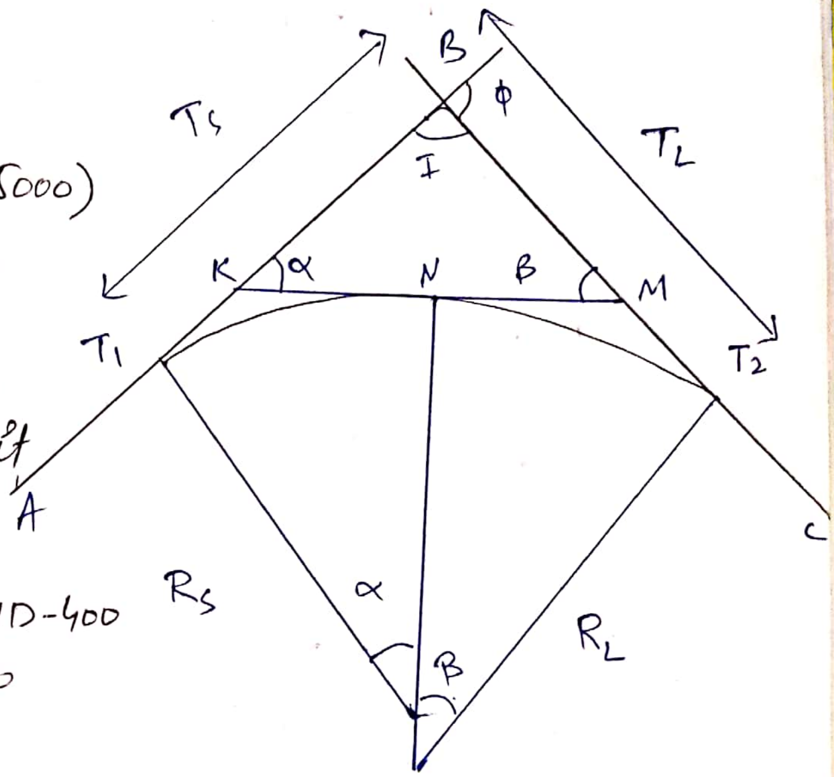
suppose it

$\boxed{R_L = 3677\,m}$

Chainage of intersection $= ID - 400$

$= 7677 - 400$

$\boxed{= 7277\,m}$



Sol

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

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

$\phi = 50^\circ + 40^\circ = 90^\circ$

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

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

$= 2677 \tan\left(\frac{50^\circ}{2}\right)$

$\boxed{KT_1 = 1248.3\,m}$

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

$= 3677 (\tan 40^\circ/2)$

$\boxed{MT_2 = 1338.31\,m}$

$KM = MT_2 + KT_1$

$= 1338.31 + 1248.3$

$\boxed{KM = 2586.61\,m}$

$\triangle BKM$ by sin rule

$BK = \dfrac{KM \times \sin(\beta)}{\sin(I)} = \dfrac{2586.61 \sin(40^\circ)}{\sin(90^\circ)}$

$\boxed{BK = 1662.6\,m}$

$BM = \dfrac{KM \times \sin(\alpha)}{\sin(I)} = \dfrac{2586.61 \sin(50^\circ)}{\sin(90^\circ)}$

$\boxed{BM = 1981.45\,m}$

$T_s = KT_1 + BK = 1248.3 + 1662.6$

$\boxed{T_s = 2910.9\,m}$

$T_L = MT_2 + BM = 1338.31 + 1981.45$

$\boxed{T_L = \cancel{33.19}\ 3319.76\,m}$

$L_s = \dfrac{\pi R_s \times \alpha}{180} = \dfrac{3.14 \times 2677 \times 50}{180^\circ}$

$\boxed{L_s = 2334.93}$

Scanned with CamScanner

$$L_L = \frac{\pi R_L \times \beta}{180^\circ} = \frac{3.14 \times 3677 \times 40^\circ}{180^\circ}$$

$$\boxed{L_L = 2565.72 m}$$

chainage of intersection = 7277 m

So

chainage of T_1 = $7277 - T_s$

$= 7277 - 2910.9$

$$\boxed{T_1 = 4366.1 m}$$

chainage of $T_2 = T_1 + L_s + L_L$

$= 4366.1 + 2334.93 + 2565.72$

$$\boxed{T_2 = 9266.75 m}$$