I·D = 7493
Subject = Advanced Engg Survey
Submitted to = Engr. Abdul Farhan

Q#01 (a)

Given :-

Tangent meet at chainage = 7493 ft
Deflection angle = 14° 13' 23"
Degree of curve = 5°

Solution :-

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

$$R = 1145.91 \text{ ft}$$

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

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

$$BT_1 = BT_2 = 142.96 \text{ ft}$$

Length of Curve

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

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

$$\boxed{L = 284.45 \text{ ft}}$$

Now T1

Chainage of intersection − tangent length

$7493 - 142.96 = 7350.44$

Chainage of $\boxed{T_1 = 7350.04 \text{ ft}}$

Now chainage of T2

Chainage of $T_1 + L$

$7350.04 + 284.45 = 7634.49$ ft

Chainage of $\boxed{T_2 = 7634.49 \text{ ft}}$

Length of chord: $l = 2R \sin(\Phi/2)$

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

$$= 283.727 \text{ ft}$$

Mid ordinat $= R\left(1-\cos\left(\frac{\phi}{2}\right)\right)$

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

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

External Distance $= R\left(\sec\left(\frac{\phi}{2}\right)-1\right)$

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

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

Q#1 (b)

Chainage (m)	Offset (m)	Simpson multiplier	Product
0	7.493	1	7.493
30	10.493	4	41.972
60	11.493	2	22.986
90	5.493	4	21.972
120	3.493	2	6.986
150	4.493	1	4.493

$\Sigma = 105.902$

Area $(h_1 - h_6)$

$b/3 \times 105.902$

$30/3 \times 105.902$

Total Area = 1059.02

Q#02

Given

Circular radius = 7493 - 7223 = 270

Deflection angles = 20° 40' 0"

Point of intersection = 7493 - 4946 = 2547

Interval = 20 m

Solution::

$$R = 270 \times 2 = 540 \text{ m}$$

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

$$= 540 \tan \frac{20^\circ 40'}{2}$$

$$BT_1 = BT_2 = 98.45 \text{ m}$$

Length of curve

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

$$L = \frac{3.14 \times 540 \times 20^\circ 40'}{180}$$

$$\boxed{L = 194.68 \text{ m}}$$

Now change Point of T1

Change Point of intersection – Tangent

$2547 - 98.45 = 2448.55$

$T_1 = 2448.55$ m

Now chainage of T2

$T_1 + L$

$2448.55 + 194.68 = 2643.23$

$T_2 = 2643.23$ m

Length of 1st Chord

$C_1 = 2465 - 2448.55$

$C_1 = 16.45$

$C_2 = C_3 = C_4 = C_5 = C_6 = C_7 = C_8 = C_9 = 20$m

$C_1 = 2643.23 - 2625$

$C_1 = 18.23$

By deflection Method:

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

$$\delta_1 = \frac{1718.9 \times 16.45}{60(540)} = 0^\circ\ 52'\ 21.77''$$

$$\delta_2 = \frac{1718.9 \times 20}{60(540)}$$

$$= 1^\circ 3' 39.78''$$

$$\delta_1 = \frac{1718.9 \times 18.23}{60\ (540)}$$

$$= 0^\circ 58' 1.73''$$

Total deflection (tangential) angle for the chord is.

$\Delta 1 = \delta_1 = 0^\circ 52' 21.77''$

$\Delta 2 = \Delta 1 + \delta_2 = 1^\circ 56' 1.55''$

$\Delta 3 = 2^\circ 59' 41.33''$

$\Delta 4 = 4^\circ 3' 21.11''$

$\Delta 5 = 5^\circ 7' 0.89''$

$\Delta 6 = 6^\circ 10' 40.67''$

$\Delta 7 = 7^\circ 14' 20.45''$

$\Delta 8 = 8^\circ 18' 0.23''$

$\Delta 9 = 9^\circ 21' 40.01''$

$\Delta 10 = 10^\circ 19' 41.79''$

Check

$$\frac{20^\circ 40'}{2} = 10^\circ 20'$$

Answer # (03)

Given Data :=>

AKM = 130°

KMC = 140°

1st Arc radius = (7493 - 300) = 7193 m

2nd Arc radius = (7493 - 200) = 7293 m

Change of intersection point = (7493 - 400) = 7093 m

Required :=>

Tangent Points = ?

Compound curvature = ?

Solution :=>

$\alpha = 180° - 130° = 50°$

$\beta = 180° - 140 = 40°$

$\phi = \alpha + \beta$

$\phi = 50° + 40° = 90°$

$I = 180° - 90° = 90°$

$KT_1 = KN = R_2 \tan(\alpha/2)$

$= 7193 \tan(5°/2)$

$\boxed{KT_1 = KN = 3354.15 \text{ m}}$

$MN = MT_2 = R_3 \tan B/2$

$= 7293 \tan(40°/2)$

$\boxed{MN = MT_2 = 2654.43 \text{ m}}$

$KM = MT_2 + KT_1$

$= 3354.15 + 2654.43$

$\boxed{KM = 6008.58 \text{ m}}$

Find $\triangle BKM$ by sin rule.

$$\frac{BK}{KM \sin B} = \frac{1}{(\sin I)}$$

$$BK = \frac{KM \sin B}{\sin I} = \frac{6008.58 \times \sin 40°}{\sin 90}$$

$\boxed{BK = 3862.24 \text{ m}}$

$$BM = \frac{6008.58 \times \sin 50°}{\sin 90}$$

$\boxed{BM = 4602.83 \text{ m}}$

$$TL = KT_1 + BK$$

$$= 3354.15 + 3862.24$$

$$\boxed{TL = 7216.39\ m}$$

$$TS = MT_2 + BM$$

$$= 2654.43 + 4602.83$$

$$\boxed{TS = 7257.26\ m}$$

$$LL = \frac{\pi R L \alpha}{180}$$

$$= \frac{3.14 \times 7193 \times 50}{180}$$

$$\boxed{LL = 6273.89\ m}$$

$$LS = \frac{\pi R_S \beta}{180}$$

$$= \frac{3.14 \times 7293 \times 40}{180}$$

$$\boxed{LS = 5088.89\ m}$$

Chainage of intersection point = 7093

$7093 - 7216.39 = -123.39$

Chainage of $T_1 = -123.39$ m

$T_1 + L + Ls$

$-123.39 + 6273.89 + 5088.89$

Chainage of $T_2 = 11239.39$ m

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