Advance Engineering Survey

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MODULE 9

Submitted to

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Q.No(01)

(a) Given Data :~

Tangent meet at chainage = 7426 ft

Deflection angle = 14°13'23"

Degree of curve = 5°

Solution :~

$D = 5°$

$R = 5729.58/D$

$= 5729.58/5° = 1145.91 ft$

Tangent length = $BT_1 = BT_2$

$R \tan \phi/2$

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

$BT_1 = BT_2 = 142.96 ft$

Length of curve

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

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

$L = 284.45 ft$

chainage of intersection point = 7426 ft

Minus tangent length = - 142.96 ft

Chainage of T_1 = 7283.04 ft

Plus L = 284.45 ft

Chainage of T_2 = 7564.49 ft

Length of chord : l

$= 2R \sin(\phi/2)$

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

= 283.72 ft

Mid ordinate

$R(1 - \cos(\phi/2))$

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

= 8.81 ft

External Distance

$R(\sec(\phi/2) - 1)$

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

= 8.88 ft

(Q.NO 1)

(b)

offset No	offset	Simpson Multiplier	Product
1	7.426	1	7.426
2	10.426	4	41.704
3	11.426	2	22.852
4	5.426	4	21.704
5	3.426	2	6.852
6	4.426	1	4.426

$\Sigma = 104.964$

Area $(h_1 - h_6)$

$= b/3 \times 104.964$

$= 30/3 \times 104.964$

$= 1049.64\ m^2$

Q.No(02)

Given Data:~

Circular radius = 7426 - 7150

= 276m

Deflection angle = 20° 40'

Point of intersection = 7426 - 5000

= 2426 m

Interval = 20m

Solution:~

$R = 276 \times 2 = 552m$

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

$BT_1 = BT_2 = 552 \tan \frac{20°40°}{2} = 100.64m$

Length of curve

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

$L = \frac{\pi \times 552\, 20°40°}{180}$

$L = 199.107$

Chainage of point of intersection = 2426m

minus tangent = -100.64m

Chainage of T_1 = 2325.36m

Plus L = 199.107m

Chainage of T_2 = 2524.467m

Length of 1st chord = C_1

= 2340 - 2325.60

= 14.4m

$C_2 = C_3 = C_4 = C_5 = C_6 = C_7 = C_8 = C_9 = 40 = 20m$

$C_{11} = 2524.467 - 2510$

$C_{11} = 14.467$

By Deflection Method

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

$$\delta_1 = \frac{1718.9 \times 14.4}{60 \times 552}$$

$$\delta_1 = 0°44'50.45''$$

$$\delta_2 = \frac{1718.9 \times 20}{60(552)}$$

$\delta_2 = 1^\circ 2' 16.74''$

$\delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = \delta_8 = \delta_9 = \delta_{10}$

$$\delta_{11} = \frac{1718.9 \times 14.467}{60(552)}$$

$\delta_{11} = 0^\circ 45' 2.97''$

Total deflection (tangential) angle for the chord is;

$\Delta_1 = \delta_1 = 0^\circ 44' 50.45''$

$\Delta_2 = \Delta_1 + \delta_2 = 1^\circ 47' 7.19''$

$\Delta_3 = 2^\circ 49' 23.93''$

$\Delta_4 = 3^\circ 51' 40.67''$

$\Delta_5 = 4^\circ 53' 57.41''$

$\Delta_6 = 5^\circ 56' 14.15''$

$\Delta_7 = 6^\circ 58' 30.89''$

$\Delta_8 = 8^\circ 0' 47.63''$

$\Delta_9 = 9^\circ 3' 4.37''$

$\Delta_{10} = \Delta_9 + \delta_{10} = 10^\circ 5' 21.11''$

$\Delta_{11} = \Delta_{10} + \delta_4 = 10^\circ 50' 24.08''$

Check $= \frac{20^\circ 40'}{2} = 10^\circ 26'$

Q.No(03)

Given Data:~

$\Delta AKM = 130^\circ$

$\Delta KMC = 140^\circ$

1st arc radius = (7426 - 300) = 7126m

2nd arc radius = (7426 - 200) = 7226m

~~3rd arc radius~~ =

Chainage of intersection (7426 - 400) = 7026m

Solution:~

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

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

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

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

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

$= 7126 \tan\left(\frac{50^\circ}{2}\right)$

$= 3322.9m$

$KT_2 = MT_2 = R_S \tan\left(\frac{\beta}{2}\right)$

$7226 \tan\left(\frac{40^\circ}{2}\right)$

$= 2630.04$

$KM = MT_2 + KT_1 = 3322.90 + 2630.04 = 5952.94m$

Now,

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

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

$$BK = \frac{5952.94 \times \sin 40^\circ}{\sin 90} = 3826.47m$$

$$BM = \frac{5952.94 \times \sin 50^\circ}{\sin 90} = 4560.21m$$

$T_L = KT_1 + BK = 5322.90 + 3826.05 = 7148.95m$

$T_S = MT_2 + BM = 2630.04 + 4560.21 = 7190.25m$

$$L_L = \frac{\pi R_L \alpha}{180} = \frac{\pi \times 7226 \times 40}{180} = 5044.69m$$

Chainage of intersection point
$= 7026m$

$-T_L = -7148.95m$

Chainage of $T_1 = -122.95m$

Plus $L_L = +6218.60m$
$= 6095.65m$

Chainage of compound curvature.

Plus L_S = + 5044.69m

Chainage of T_2 = 1140.34m