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I.D : 7497

Semester : 10th

Subject : Highway & Transportation

Teacher : Engr Farhan

Date:

Day: M T W

Question no 1(a)

Two tangents meet at a chainage : 7497 ft
Deflection angle : 14° 13' 23"
Degree of curve : 5°

Solution :

D = 5°

R = 5729.58 / D

= 5729.58 / 5° = 1145.9171

Tangent length = $BT_1 = BT_2$

$R \tan\left(\frac{\Phi}{2}\right)$

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

$BT_1 = BT_2 = 142.96$ ft

Length of curve :

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

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

L = 284.45 ft

Chainage Intersection : 7497

minus Tangent length : -142.96ft

Chainage of T_1 = 7354.04

Plus L = 284.45ft

Chainage of T_2 = 7781.45ft

length of chord =

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

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

$$= 283.72\,ft$$

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

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

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

$$= 8.88\,ft$$

Question no 1(b):

Offset No	offset	Simpson multiplies	Product
1	7.947	1	7.947
2	10.947	4	43.788
3	11.947	2	23.894
4	5.947	4	23.788
5	3.947	2	7.894
6	4.947	1	4.947
			$\Sigma = 112.258$

Area (h_1 to h_6)

$= \frac{b}{3} \times 112.258$

$= \frac{30}{3} \times 112.258$

Total A = $1122.58\ m^2$

Question no 2

Given DATA:

7497 - 7250 = 247m

Deflection angle = 20°40'

Point of intersection = 7497 - 5000

= 2497

Tnterval = 20m

Sol.

R = 247 x 2 = 494

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

$= 494 \tan\left(\frac{20°40'}{2}\right)$

$= 494 \tan\left(\frac{20°40'}{2}\right)$

= 90.07

length of curve = $L = \pi R \Phi/180$

$= \frac{3.14(494)(20°40')}{180}$

= 178.10m

Chainge of point Intersection: 2497

Minus Tangent = -90

Chainge of T_1 = 2407

Plus L = 183.86

Chainage of T_2 = 2590.86

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length of chord 1st = C_1 = 2460 - 2407

= 53

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

C_{11} = 2590.86 - 2680

= -39.14

By deflection method

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

$$= \frac{1718.9 \times 53}{60(494)}$$

$$= 30'24.98''$$

$$S_2 = \frac{1718.9 \times 20}{60(494)}$$

$$= 1^\circ 9' 35.47''$$

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

$$\delta_{11} = \frac{1718.9 \times 18.40}{60(49)}$$

$\delta_{11} = 1^\circ 4' 1.43''$

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Total deflection angle for chord is

$\Delta_1 = \delta = 3°4'24.98''$

$\Delta_2 = \delta_1 + \delta_2 = 1°9'35.47'' + 3°4'24.98''$

$\Delta_2 = 1°50'38.34''$

$\Delta_3 = 2°57'43.8''$

$\Delta_4 = 3°51'$ [illegible] $8''$

$\Delta_5 = 4°52'12.78''$

$\Delta_6 = 5°52'44.26''$

$\Delta_7 = 6°53'15.74''$

$\Delta_8 = 7°53'47.22''$

$\Delta_9 = 8°54°18.7''$

$\Delta_{10} = 9°54'50.18''$

$\Delta_{11} = 10°50'31.34''$

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

$= 10°20'$

Q:

Given DATA

$\Delta AKM = 130°$

$\Delta KMC = 140°$

1st Arc radius = 7497 - 300 = 7197m

2nd Arc radius = 7497 - 200 = 7297 m

Change of intersection point = 7497 - 400 = 7097m

Required = Tangent Points = ?

Compound curvature = ?

$\alpha = 180° - 130° = 50°$

$\beta = 180° - 140° = 40°$

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

$I = 180 - \phi = 180° - 90° = 90°$

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

$= 7197 \tan(50°/2)$

$KT_2 = KN = 3356.$

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

$= 7297 \tan\left(\frac{40°}{2}\right)$

$MN = MT_2 = 2655.8$

$KM = MT_2 + KT_1 = 3356 + 2655.8$

$KM = 6011.8$

Now $\frac{Bk}{MkSinB} = \frac{1}{SinI}$

$Bk = \frac{6011.8 \times Sin\,40^\circ}{Sin\,90^\circ}$

$= 3864.31$

$BM = \frac{kMSin\alpha}{Sin\,I}$

$\frac{6011.8 \times Sin\,50^\circ}{Sin\,90^\circ}$

$= 4605.30$

$TL = kT_1 + Bk = 3356 + 3864.31 = 7220.31$

$T_s = MT_2 + BM = 2655.8 + 4605.30 = 7261.1$

$L_L = \frac{\pi R_L \alpha}{180} = \frac{\pi \times 7197 \times 50^\circ}{180} = 6277.38$

$L_s = \pi \frac{R_s B}{180} = \pi \times \frac{7297 \times 40}{180} = 5056.79$

Chainage of Intersection point = 7097

Minus TL = 7220.31

Chainage of Ti = -123.31

Plus L = 6277.38

= 6154.07

Chainage of compound curvature:

Plus Ls = 5056.79

Chainage of T2 = 11210.86