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SECTION: "B"

DEPARTMENT: BE Civil

SUBJECT: Advance Eugg. Survey.

IQRA NATIONAL UNI

Ques # 01

a) => Two tangents meet at a chainage of (1D) ft with the deflection angle of 14°13'23". Degree of curve is 5°.

Calculate:

1) Chainage at the beginning and end of the curve.
2) Length of long chord.
3) Mid ordinate and external distance.

=> Given data:-

Tangent meet at chainage = 7963ft.

Deflection angle = 14°13'23"

Degree of curve = 5°

Solution:-

D = 5° (given)

R = 5729.58/D

R = 5729.58/5°

R = 1145.91 ft.

Tangent length = $BT_1 = BT_2 = R\tan(\phi/2)$

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

$BT_1 = BT_2 = 142.96$ ft.

Length of curve:

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

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

$L = 284.45$ ft.

chainage of intersection point = 7963

minus tangent length = - 142.96 ft

chainage of T_1 = 7820.04 ft

plus L = 284.45 ft.

chainage of T_2 = 8104.49 ft

Length of chord = $l = 2R\sin\left(\frac{\Phi}{2}\right)$

putting values in above eqv.

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

$$l = 283.72 \text{ ft.}$$

Mid ordinate:

$$= R\left(1 - \cos \Phi/2\right)$$

putting values.

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

$$= 8.81 \text{ ft}$$

External distance:

$$= R\left(\sec\left(\Phi/2\right) - 1\right)$$

putting values.

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

$$= 8.88 \text{ ft}$$

QUES # 01 (b):

Find the area from the data obtained from chain survey, as shown in the table, using Simpson's one third rule. The first offset is your ID ÷ 1000. e.g if someone having ID 7963, then his/her first offset will be 7.963 and so on.

Offset No	offsets	Simpson's multiplier	Product
1	7.963	1	7.963
2	10.963	4	43.852
3	11.963	2	23.926
4	5.963	4	23.852
5	3.963	1	3.963
			$\Sigma = 103.556$

Area $(h_1 - h_5) = b/3 \times 103.556$

$= \frac{30}{3} \times 103.556.$

$= 10 \times 103.556.$

$= 1035.56\ m^2$

Area $(h_5 - h_6) = \frac{30}{2}(h_5 + h_6)$

$= 15\ (3.963 + 4.963).$

$= 15\ (8.926).$

$= 133.89 m^2$

Total area $= 1035.56 + 133.89.$

Total area $= 1169.45 m^2$

QUES # 02

=> A circular curve of radius (I.D - 200)m deflecting right through $20°40'$, is to be set out b/w two straights having chainage of the point of intersection as (I.D. 400)m.

=> Calculate all the data necessary for setting out the curve using deflection angle method, with Peg interval being 20m.

Given data:-

Circular radius =

$$7963 - 7679 = 284m$$

(7679 is assummed value).

Deflection angles = $20^\circ 40'$

Point of intersection = 7963 - 5416 = 2547m

Interval = 20m.

Solution:

$R = 284 \times 2 = 568.$

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

Putting values.

$BT_1 = BT_2 = 568 \tan \frac{20^\circ.40'}{2}.$

$\boxed{BT_1 = BT_2 = 103.56 m.}$

Length of curve = $L = \frac{\pi R \Phi}{180}$

putting values in above eqv.

$L = \frac{3.14 \times 568 \times 20^\circ.40'}{180}$

$\boxed{L = 204.87 m.}$

chainage of point of intersection = 2547m.

minus tanget = -103.56

chainage of T_1 = 2443.44

Plus L = + 204.87

chainage of T_2 = 2648.31 m.

Length of 1st chord = C_1

= 2460 - 2443.44

= 16.56m.

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

C_{11} = 2648.40 - 2630

= 18.40m

By Deflection Method:

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

$$\delta_1 = \frac{1718.9 \times 16.56}{60\,(568)}$$

$$\delta_1 = 0^\circ 50' 6.86''$$

$$\delta_2 = \frac{1718.9 \times 20}{60\,(568).}$$

$$\boxed{\delta_2 = 1^\circ\ 0'\ 31.48''}$$

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

and

$$\delta_{11} = \frac{1718.9 \times 18.40}{60\,(568).}$$

$$\boxed{\delta_{11} = 0^\circ\ 55'\ 40.96''}$$

total deflection (tangential) angle for the chord is ;

$$\Delta_1 = \delta_1 = 0^\circ\ 55'\ 6.86''$$

$$\Delta_2 = \delta_1 + \delta_2 = 0^\circ 55' 6.86'' + 1^\circ\ 0'\ 31.48''$$

$$\Delta_2 = 1^\circ 50'\ 38.34''$$

$$\Delta_3 = 2^\circ\ 51'\ 9.82''$$

$$\Delta_4 = 3^\circ\ 51'\ 41.3''$$

$$\Delta_5 = 4^\circ\ 52'\ 12.78''$$

$$\Delta_6 = 5^\circ\ 52'\ 44.26''$$

$\Delta 7 = 6^\circ 53' 15.74''$

$\Delta 8 = 7^\circ 53' 47.22''$

$\Delta 9 = 8^\circ 54' 18.7''$

$\Delta 10 = 9^\circ 54' 50.18''$

$\Delta 11 = 10^\circ 50' 31.34''$

Check :-

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

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

QUES # 03

=> Two tangents AB & BC are intersected by a line KM. The angles AKM and KMC are 130° and 140° respectively. The radius of 1st arc is (7963 - 300)m and of 2nd arc is (7963 - 200)m. Find the chainage of tangent points and the point of compound curve given that the chainage of intersection point is (7963 - 400)m.

Given data:-

$\Delta AKM = 130°$

$\Delta KMC = 140°$

=> 1st arc radius = (7963 - 300) = 7663m

=> 2nd arc radius = (7963 - 200) = 7763m

chainage of intersection point (7963 - 400) = 7563m

=> Required =>

Tangent points = ?

Compound curvature = ?

=> Solution:

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

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

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

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

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

$= 7663 \tan(50^\circ/2)$

$KT_1 = KN = 3573.31m$

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

putting values in above equation.

~~$7763 (40^\circ/2)$~~

$= 7763 \tan(40^\circ/2)$.

$MN = MT_2 = 2825.50$ m.

$KM = MT_2 + KT_1 = 2825.50 + 3573.31$

$KM = 6398.81\ m.$

Now;

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

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

putting values in above eq.

$$BK = \frac{6398.81 \times \sin(40^\circ)}{\sin 90^\circ}$$

$$BK = \frac{6398.81 \times 0.642}{1}$$

$$BK = 4108.03\ m.$$

Now;

$$BM = \frac{MK \times \sin\alpha}{\sin I}$$

putting values.

$$BM = \frac{6398.81 \times \sin(50^\circ)}{\sin(90^\circ)} = 4901.48\ m.$$

$T_L = KT_1 + BK = 3573.31 + 4108.03$

$T_L = 7681.34\ m.$

$T_S = MT_2 + BM = 2825.50 + 4901.48$

$T_S = 7726.98\ m.$

$L_L = \frac{\pi R_L \alpha}{180} = \frac{3.14 \times 7663 \times 50^0}{180}$

$L_L = 6683.83\ m.$

$L_S = \frac{\pi R_S \beta}{180} = \frac{3.14 \times 7763 \times 40^0}{180}$

$L_S = 5416.84\ m.$

chainage of intersection point: = 7563m

chainage of intersection point

$-T_L = -7681.34\ m.$

chainage of $T_L = -118.34$

plus L = + 6683.83m

= 6565.49.m.

chainage of compound curvature:

(N) plus Ls = 5416.84m.

chainage of T_2 = 11982.33m