Q NO 1:-

Part (a):-

Two tangents not at a chainage of 7929 with deflection angle at 14°13'23". Degree of curve is 5°.

① Chainage at begining & end of curves

Solⁿ:-

Degree = 5°

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

$= 1145.916 ft.$

Chainage at begin and end of curves

First we have to find.

Tangent length = $R \tan \frac{\Delta}{2}$

$= 1145.916 \times \tan\left(\frac{14°13'23"}{2}\right)$

$= 1452.22 ft$

Now length of curve is

$L = \frac{\pi R \Delta}{180} \Rightarrow \frac{3.14 \times 1145.916 \times 14°13'23"}{180°}$

$L = 2841.9'$

Now chainage at begining of curve:-③

$= 7939 - 145.22$

$= 7783.78$

chainage at end of curve:

$= 7783.78 + 284.19$

$= 8067.97.$

② Length of long chord:-

$I = 2R\sin(\Delta/2)$

$I = 2(1145.916) \times \sin(14°13'23'')$

$I = 283.73$

③ Mid-ordinate and extersnd distance:-

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

$= (1145.916)(1 - \cos(14°13'23''))$

$= 8.814.$

Extersnd $= R\left(\frac{1}{\cos\frac{\Delta}{2}} - 1\right)$

$= (1145.916)\left(\frac{1}{\cos(14°13'23'')} - 1\right)$

$= 8.813$

Q No 1

Part (b)

chainge (m)	0	30	60	90	120	150
offset (m)	7.929	7.929 +3	7.929 +4	7.929 -2	7.929-4	7.929-3

offset :-

$O_1 = 7.929$

$O_2 = 10.929$

$O_3 = 11.929$

$O_4 = 5.929$

$O_5 = 3.929$

$O_6 = 4.929$

The num of offsets are even and intercept is odd, so we have to find the area b/w the offset O_1 and O_5 and the O_5 and O_6.

$$A = A_1 + A_2$$

First we calculate the area A_1 and A_2.

A_1 b/w O_1 and O_5 & A_2 b/w O_5 & O_6.

$$A = \frac{h}{3}(O_1 + O_5 + 2(O_3) + 4(O_2 + O_4))$$

$$A_1 = \frac{30}{3}(7.929 + 4.929 + 3(11.929) + 4(10.929 + 0.5829))$$

$$A_1 = 10(7.929 + 4.929 + 23.858 + 67.439)$$

$$A_1 = 1041.48m$$

Now A_2 =

$$A_2 = \frac{(O_5 + O_6)}{2} h$$

$$A_2 = \left(\frac{3.929 + 4.929}{2}\right) \times 30$$

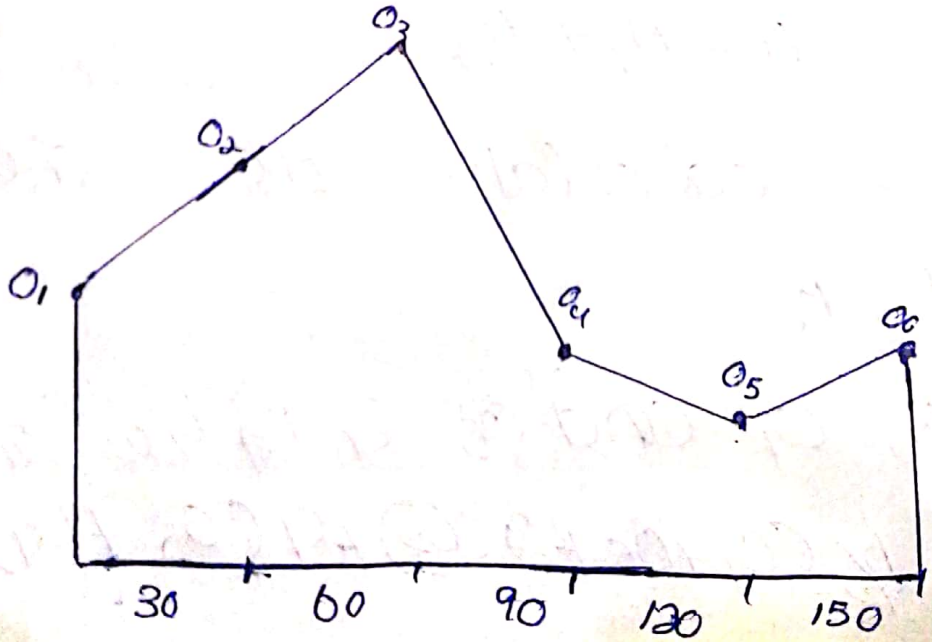
$$\boxed{A_2 = 139.87}$$

Now find total area we get

$$A = A_1 + A_2$$

$$A = 1041.48 + 139.87$$

$$A = 1174.35$$



Q No 03:-

Given data:-

Radius = (Id - 7229)

angle = 20°40'

Point of intersection = (Id - 6090)

Required:-

calculate all the data necessary for the curve using deflection method with peg interval being 30m.

Sol'n:-

Radius = (7929 - 7229)m

= 700m

angle of deflection = Δ = 20°40

chainage at point of intersection

= 7929 - 6090

= 1839m

Peg interval = 30m

Now we will calculate the tangent length ②

Tangent length = $R \tan \frac{\Delta}{2}$.

$= 700 \tan\left(\frac{20°40'}{2}\right)$

$= 127.63$ m.

length of curve $= \frac{\pi D \theta}{180°}$

Put values

$= \frac{3.14 \times 700 \times 20°40'}{180°}$

$= 252.36$ m

Now chainage of first point T_1:-

chainage of first tange point T_1 + length of curve.

$= 1721.37 + 252.56$

$\Rightarrow 1963.7$ m.

Now we will find number of chords

Peg interval = 20m.

length of curve = 252.36

No of chords $= \frac{252.36}{20} \Rightarrow 12$.

length covers by chords = 12 x 20

= 240m

length of curve = 252.36 - 240

= 12.36

In above 240m is the intermediate length of chord and 12.36 is the initial and final length of subchords and final sub chord as

$C_1 = 7m$

$C_n = 4$

deflection angle for initial sub-chord

$$\delta_1 = \frac{1718.9 \times 7}{100}$$

$$\delta_1 = \frac{12032.3}{100}$$

$$\delta_1 = 0^\circ 17' 21.34''$$

Now deflection angle for 2nd chord to 12th:-

$$\delta_{2-12} = \frac{1718.9 \times C}{R}$$

$$\delta_{2-12} = \frac{1718.9 \times 20}{700}$$

$$\delta_{2-12} = 0°49'6.69''$$

Deflection angle for final sub-chord:-

$$\delta_n = \frac{1718.9 \times C_n}{700}$$

$$\delta_n = \frac{1718.9 \times 14}{700}$$

$\delta_n = 0°49'6.69''$ ~~$0°9'49.34''$~~

Arithmetic check:-

$\frac{90°40'}{20}$ = $0°17'21.34'' + 12(0°49'6.69'') + 0°9'49.34''$ ~~$0°49'6.69''$~~

$18°20'0.00'' = 18°20'0.96''$

Q3:

Let T_1 & T_2 be the tangent points and N be the curvature.

→ KT_1 and KN the tangents to the first of the compound curve.

→ MN and MT_2 the tangents to the second of the compound curve

→ and α and β are the central curve angles of the first & second curves respectively.

Radius of 1st arc = 7929-300)m

R_1 = 7629

Radius of 2nd arc = 7929 -200)

R_2 = 7729 m

The central angles α and β are. (10)

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

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

Now

$$KT_1 = KN = R_1 \tan\frac{\Delta}{2}.$$

$$KT_1 = KN = 7629 \tan\left(\frac{50^\circ}{2}\right)$$

$$= 3557.46m$$

Now

$$MT_2 = MN = R_2 \tan\left(\frac{\beta}{2}\right)$$

$$= 7729 \tan\left(\frac{40^\circ}{2}\right)$$

$$\boxed{MT_2 = MN = 2813.12\,m}$$

Now

$$KM = KN + MN$$

$$KM = 3557.46 + 2813.12$$

$$KM = 6370.58$$

Now in ΔBKM, $\angle BKM = 50^\circ$

$\angle BMK = 40^\circ$

$\angle KBM = 180^\circ - 50^\circ - 40^\circ$

$= 90^\circ$.

$\therefore BK = \frac{6370.58 \times \sin 40^\circ}{\sin 90^\circ}$

$BK = 4094.92$

$\therefore BM = \frac{6370.58 \times \sin 50^\circ}{\sin 90^\circ}$

$BM = 4880.14$

Here tangent length

$BT_1 = BK + KT_1$

$BT_1 = 4094.92 + 3557.46$

$\boxed{BT_1 = 7652.38}$

and tangent length.

$BT_2 = BM + MT_2$

$BT_2 = 4880.14 + 2813.12$

$\boxed{BT_2 = 7693.26}$

length of first branch

$= \pi \times R_1 \times \alpha$

$= 3.14 \times 7629 \times 50^\circ$

$= 6915^\circ$

leng of 2nd branch.

$= \frac{\pi \times R_2 \times \beta}{180^\circ}$

$= \frac{3.14 \times 7729 \times 48}{180^\circ}$

$= 5398.124\ m$.

Now chainage of intersection point B - tangent length (BT_1) - chainage of a tangent point T_1.

chainage of Tangent point (T_1)

$= 7729 - 7652.38$

$= 76.62$

~~Note:-~~

Now we will get by calculation of chainage point of compound curvature (N);

chainage points of tangent (T_1) + length of first branch.

chainage of the point of compound curvature:

$= 76.62 + 6915$

$= 6991.62$

Now odd length of 2nd branch.

$= 6991.62 + 5393.124$

$= 12384.744m$

chainage of tangent point T_2.