Name Manzoor Khan

Sec C

ID 7678

Department BE (C)

paper: Advance Engineering Surveying

Submitted to Engr. Abdul Farhan

Q.No 1
Ans:

Given data:

$R = 300m$

$\phi = 60°$

Required data:

(1) What is its degree by
(a) Arch definition
(b) chord definition of standard length

(i) length of curve = ?

(ii) tangent length = ?

(iv) length of chord = ?

(v) Mid ordinate = ?

(vi) apex distance = ?

Solution:

(a) Arch definition:

Here standard length = S = 30m

Then

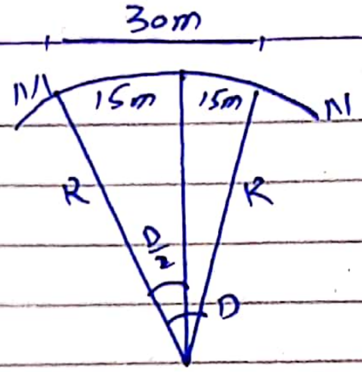
$$\Rightarrow \frac{D}{360} = \frac{30}{2\pi R}$$

$$\Rightarrow D = \frac{30 \times 360}{2\pi \times R}$$

$$\Rightarrow D = \frac{30 \times 360}{2\pi \times 300}$$

$$\Rightarrow \boxed{D = 5.730}$$

Ans:



(b) chord def:

$$R = \frac{S}{\sin \frac{D}{2}}$$

$$D = \sin^{-1}\left(\frac{2 \times S}{R}\right)$$

$$= \sin^{-1}\left(\frac{2 \times 15}{300}\right)$$ Here $S = 15m$

$$\boxed{D = 5.730}$$ Ans:.

(i) length of curve:

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

$$= \frac{\pi \times 300 \times 60^\circ}{180^\circ}$$

$$\boxed{L = 314.16m}$$ Ans:.

(ii) Tangent length:

$$\Rightarrow BT \; BT_1 = BT_2 = R \tan \frac{\Phi}{2} =$$

$$BT = 300 \times \tan\left(\frac{60}{2}\right)$$

$$\boxed{BT = 173.21\ m}$$ Answer.

(iii) length of long chord:

$$l = 2R \sin \frac{\phi}{2}$$

$$= 2 \times 300 \times \sin \frac{60}{2} = \boxed{300\ m}$$ Ans

(iv) Mid Ordinate:

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

$$= 300\left(1-\cos\frac{60}{2}\right)$$

$$\boxed{M = 40.19\,m}$$ Answer:

(V) Apex distance:

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

$$= 300\left(\sec\frac{60}{2}-1\right)$$

$$\boxed{BF = 46.41\,m}$$ Answer:

Q No 2

Ans:- => Given data:

=> Deviation Angle = Δ = 45°

=> R = 200 m

=> ch. of apex = 1839.2 m

=> Peg interval = 10 m

=> Offset from chord (use peg interval 20 m. if needed.

=> Required data:

Culate necessory data:

=> Solution:

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

$$= 200 \times \tan\frac{45}{2}$$

$$= 82.84\,m$$

$$\text{Chainage of } T_1 = \text{ch. of Appex} - \text{Tangent length}$$

$$= 1839.2 - 82.84\,m$$

$$= 1756.36\,m$$

$$\text{Length of Curve} = \frac{\pi R \Delta}{180^\circ} = \frac{200 \times \pi \times 45^\circ}{180^\circ}$$

$$= 157.08\,m$$

$$\text{ch. of } T_2 = 1756.36 + 157.08$$

$$= 1913.44\,m$$

By offset from ~~tang~~ chords produced:

length of 1st Sub chord = b_1 = 13.64
length of Normal chord = 30m = b_2
Since, length of chain is 157.08m,
$b_3 = b_4 = b_5 = 30m$
chainage of forward tangent = 1913.44 m
= 63 chain + 23.44m
length of last chord = 23.44 m

$$O_1 = \frac{b_1^2}{2R} = \frac{13.64^2}{2\times200} = 0.47m$$

$$O_2 = \frac{b_2(b_1+b_2)}{2R} = \frac{30(30+13.64)}{2\times200}$$

$= 3.27m$

$$O_3 = \frac{b_2^2}{R} = \frac{30^2}{200} = 4.5m$$

$O_3 = O_4 = O_5 = 4.5m$

$$O_6 = \frac{b_n(b_{n-1}+b_n)}{2R} = \frac{23.44(23.44+30)}{2\times200}$$

$O_6 = 3.13m$

Q No 3:-
Ans: Given data:

$R = 17.5$

$\Delta = 32°40'$

ch. of I = (51+9.35)

length of one chain = 20 m.

Required data:

Calculate necessory data.

Solution:

As

$R = 17.5 \times 20 = 350\,m$

$\Delta = 32°40' = 32.667°$

$\frac{\Delta}{2} = 16°20'$

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

$= 350 \tan 16°20'$

$\boxed{T = 102.57\,m}$ Answer

length of Curve $= L = \frac{\pi R \Delta}{180°}$

$= \frac{\pi \times 350 \times 32°40'}{180°}$

$\boxed{L = 199.55\,m}$ Answer.

ch. of T_1 = ch. of I − Tangent length

$= (51+9.35) - 102.57$

$= (51 \times 20 + 9.35) - 102.57$

$= 926.78\,m = 46 + 6.78$

Note: Here one chain = 20 m

ch. of T_2 = ch. of $T_1 + L$

$= 926.78 + 199.55$

$= 1126.33m$

$= 56 + 6.33$

$\frac{1126.33}{20} = 56 + 6.33$

length of first chord $= C_f = (46+20) - (46+6.78)$
$= 13.22m$

length of last chord $= C_l = (56+6.33) - (56+0)$
$= 6.33m$

Number of Normal chord $= 56 - 47 = 9$

Total Number of chord $= 9 + 2 = 11$

Now Tangential angles;

$\delta_1 = 1718.9 \times \frac{13.22}{350}$
$= 64.925 = 64°55'30''$

$\delta_2 - \delta_{10} = 1718.9 \times \frac{20}{350}$

$= 98.223'$
$= 98°13'22.80''$

$\delta_{11} = 1718.9 \times \frac{6.33}{350}$

$= 31.088'$
$= 31°5'16.80''$

Now;
Deflection Angles

$\Delta_1 = \delta_1 = 64°55'30''$

$\Delta_2 = \Delta_1 + \delta_2 = 64°55'30'' + 98°13'22.80''$
$= 2°43'09''$

$\Delta_3 = \Delta_2 + \delta_3 = 163.148' + 98.223'$
$= 261.37' = 4°21'22''$

$\Delta_4 = \Delta_3 + \delta_4 = 261.37' + 98.223' = 359.594'$
$= 5°59'36''$

$\Delta_5 = \Delta_4 + \delta_5 = 359.594' + 98.223' = 457.817'$
$= 7°37'39''$

$\Delta_6 = \Delta_5 + \delta_6 = 457.817' + 98.223' = 556.040'$
$= 9°16'02''$

$\Delta_7 = \Delta_6 + \delta_7 = 556.040 + 98.223 = 654.263'$
$= 10°54'16''$

$\Delta_8 = \Delta_7 + \delta_8 = 654.263' + 98.228'$
$= 752.486' = 12°32'29''$

$\Delta_9 = \Delta_8 + \delta_9 = 752.486' + 98.223'$
$= 850.709' = 14°10'43'$

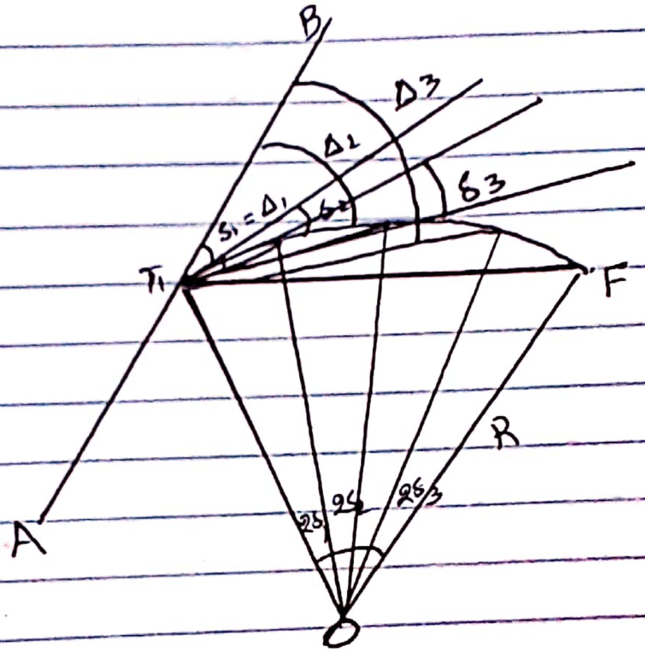
$\Delta_{10} = \Delta_9 + \delta_{10} = 850.709' + 98.223'$
$= 948.932' = 15°48'56''$

$\Delta_{11} = \Delta_{10} + \delta_{11} = 948.932 + 31.088'$
$= 980.020'$
$= 16°20'00''$

Check:-

$$\Delta_{11} = \frac{\Delta}{2} = \frac{32^\circ 40'}{2}$$

$$= 16^\circ 20' \text{ (Okay)}$$



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