# MID TERM EXAM

NAME : MUHAMMAD TALHA

ID : 7965

SECTION : "B"

SUBJECT : ADVANCE SURVEY (II)

SUBMITTED TO : SIR FARHAN

SEMESTER : "4"

DEPARTMENT : BE (CIVIL)

DATE : 23-4-2020

Date: ..............
Day: [illegible]



# QUESTION :- 1A

## Given :

Degree of Curve = $5^\circ$
Deflection Angle $= \theta = 14^\circ 13' 23''$
Chainage Intersection = 7965 ft (ID)

## Solution :

$$\text{Radius} = \frac{5729.28}{D}$$

$$\text{Radius} = \frac{5729.28}{5^\circ}$$

$$R = 1145.85 \text{ ft}$$

(1) **Length of long chord :-**

$$= 2R \sin \theta/2$$
$$= 2(1145.85) \sin(14^\circ 13' 23''/2)$$
$$= 2291.7 \sin(7^\circ 6' 41.5'')$$
$$= 283.7150 \text{ ft}$$

(2) **Mid-Ordinate :-**

$$= R(1 - \cos \theta/2)$$
$$= 1145.85(1 - \cos 14^\circ 13' 23''/2)$$

$= 1145.85\,(1 - \cos 7^\circ 6' 41.5'')$

$= 1145.85\,(1 - 0.9923)$

$= 1145.85\,(\times)\,(7.7 \times 10^{-3})$

$= 8.823$ ft

(3) External Distance $= R\left(\dfrac{1}{\cos \theta/2} - 1\right)$

$= 1145.85\left(\dfrac{1}{\cos \frac{14^\circ 13' 23''}{2}} - 1\right)$

$= 1145.85\left(\dfrac{1}{\cos 7^\circ 6' 41.5''} - 1\right)$

$= 1145.85\left(\dfrac{1}{0.9923} - 1\right)$

$= 1145.85\left(\dfrac{1 - 0.9923}{0.9923}\right)$

$= 1145.85\left(\dfrac{7.7 \times 10^{-3}}{0.9923}\right)$

$= 1145.85\,(7.759 \times 10^{-3})$

$= 8.891$ ft

(4) Tangent length = $R \tan \theta/2$

$= 1145.85 \tan \frac{14°13'23''}{2}$

$= 1145.85(\tan 7°6'41.5'')$

$= 1145.85(0.124)$

$= 142.08$ ft

Now, Length of Curve, $= \frac{\pi R \theta}{180°}$

$= \frac{3.14 \times 1145.85 \times 14°13'23''}{180°}$

$= 284.30$ ft

At last,

Intersection chainage $= 7965$ ft
Minus Tangent length $= -142.08$ ft
$(T_1)$ $= +7822.92$ ft
Add Curve length $= +284.30$ ft
$(T_2)$ $= 8107.22$ ft

## QUESTION :- 1B

| Chainage (m) | 0 | 30 | 60 | 90 | 120 | 150 |
|---|---|---|---|---|---|---|
| offset (m) | 7.965 | 10.965 | 11.965 | 5.965 | 3.965 | 4.965 |

offsets = 6
Intercepts = 5
Intervals = 30

As Intercept is even no. So we will Calculate Area from 1st to 5th, And the area between 5th And 6th is Calculated Seperately.

| Offsets NO | offset | Simpson's Multiplier | product |
|---|---|---|---|
| 1(E) | 7.965 | 1 | 7.965 |
| 2 (O) | 10.965 | 4 | 43.86 |
| 3 (E) | 11.965 | 2 | 23.93 |
| 4 (O) | 5.965 | 4 | 23.86 |
| 5 (E) | 3.965 | 1 | 3.965 |
| | | | $\Sigma = 103.58$ |

Scanned with CamScanner

$$\text{Area } (h_1 - h_5) = \frac{30}{3}(103.58) = 1035.8\ m^2$$

$$\text{Area } (h_5 - h_6) = \frac{30}{2}(3.965 + 4.965) = 133.95\ m^2$$

$$\text{Total Area} = 1035.8 + 133.95$$

$$= 1169.75\ m^2$$

# QUESTION :- 02

**Given :-**

$\theta = 20^\circ 40'$

Radius $= 7965 \div 12 = 663.75m$

Intersection chainage $= ID - 400$

$= 7965 - 400$

$= 7565 \text{ m}$

Pig Interval $= 20m$

**Solution :-**

Tangent length $= R \tan \theta/2$

$= 663.75 \tan \frac{20^\circ 40'}{2}$

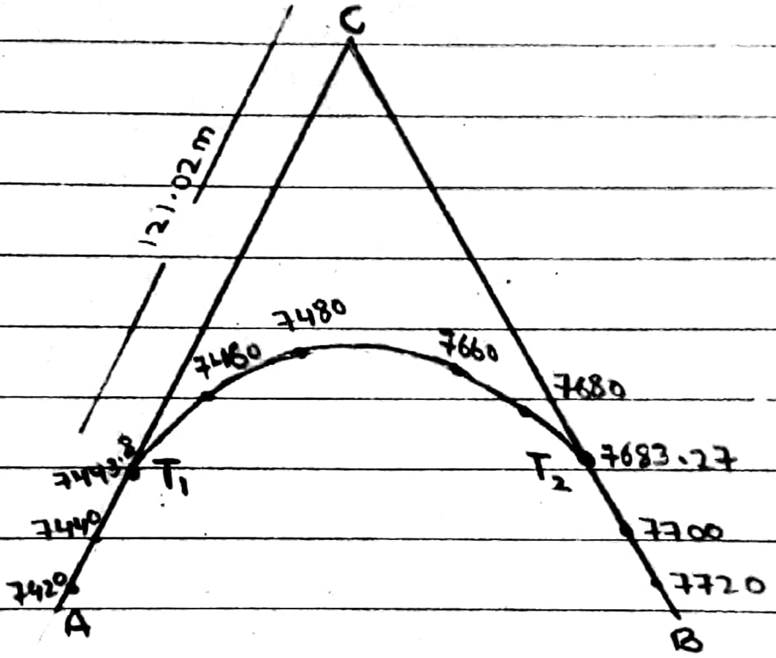
$= 121.02m$

Length of Curve $= \frac{R \pi \theta}{180^\circ}$

$= \frac{663.75 \times 3.14 \times 20^\circ 40'}{180^\circ}$

$= 239.294 \text{ m}$

Intersection chainage = + 7565 m
Minus Tangent length = − 121.02 m
($T_1$) = + 7443.98 m
Add Curve length = + 239.294 m
($T_2$) = 7683.274 m




**For Initial Chord =**

7420 7440 7443.98 7460 7480

Initial chord = 7460 − 7443.98 ($T_1$)

Initial chord = 16.02 m ($C_1$)

**For Final Chord =**

7660 7680 7683.27 7700 7720

Final chord = 7683.27 ($T_2$) - 7680

Final chord = 3.27 m ($C_f$)

**For No of chords :-**

= 7680 - 7460

= 220

P/g Interval = 20

So, Divide by 20, we get

$= \frac{220}{20}$

= 11 No of chords

~~By Deflection Angle~~

And,

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

$C_9 = C_{10} = C_{11} = C_{12}$

**By Deflection Angle :-**

$$\delta_1 = \frac{1718.9\, C_1}{R}$$

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

$$= \frac{1718.9 \times 16.02}{60 \times 663.75}$$

$$= 0^\circ 41' 29.2''$$

$$\delta_{13} = \frac{1718.9 \times C_{12}}{60 \times R}$$

$$= \frac{1718.9 \times 3.27}{60 \times 663.75}$$

$$= 0^\circ 8' 28.09''$$

$$\delta_2 = \frac{1718.9 \times C_2}{60 \times R}$$

$$= \frac{1718.9 \times 20}{60 \times 663.75}$$

$$= 0^\circ 51' 47.62''$$

So, $\delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = \delta_8$

$\delta_9 = \delta_{10} = \delta_{11} = \delta_{12}$

Now Total Deflection Angle for the Chords :-

$\Delta_1 = \delta_1 = 0°41'29.2''$

$\Delta_2 = \delta_1 + \delta_2 = \Delta_1 + \delta_2 = 0°41'29.2'' + 0°51'47.62''$
$= 1°33'16.82''$

$\Delta_3 = \Delta_2 + \delta_3 = 1°33'16.82'' + 0°51'47.62''$
$= 2°25'4.44''$

$\Delta_4 = 3°16'52.06''$
$\Delta_5 = 4°8'39.68''$
$\Delta_6 = 5°0'27.3''$
$\Delta_7 = 5°52'14.92''$
$\Delta_8 = 6°44'2.54''$
$\Delta_9 = 7°35'50.16''$
$\Delta_{10} = 8°27'37.78''$
$\Delta_{11} = 9°19'25.4''$

$\Delta_{12} = \Delta_{11} + \delta_{12} = 9°19'25.4'' + 0°51'47.62''$
$= 10°11'13.02''$

$\Delta_{13} = \Delta_{12} + \delta_{13} = 10°11'13.02'' + 0°8'28.09''$
$= 10°19'41.11''$

Check : $\Delta_{13} = \theta/2 = \frac{20°40'}{2} = 10°20'0''$

Date: ________



# QUESTION :- 03

## Given Data :-

$\overset{A}{\Delta} KM = \alpha = -130^\circ + 180^\circ = 50^\circ$

$\Delta KMC = \beta = -140^\circ + 180^\circ = 40^\circ$

$R_1$ = Radius = 10-300 , 7965-300 = 7665 m

$R_2$ = Radius = 10-200 7965-200 = 7765 m

Chainage of Intersection point = 10-400
= 7965-400 = 7565 m

## Required Data :-

Tangent points = ?

Compound Curvature = ?

## Solution :-

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

$I = \cancel{\text{Interse}}\ 180^\circ - 90^\circ = 90^\circ \quad \because 180 - \Phi$

Now,

$KT_1 = KN = R_1 \tan(\alpha/2)$

$= 7665 \tan(50^\circ/2)$

$= 3574.24 m$

Now,

$$MN = MT_2 = R_2 \tan(B/2)$$

$$= 7765 \tan(40^\circ/2)$$

$$= 7765 \tan(40^\circ/2)$$

$$= 2826.22\ m$$

So, $MN = MT_2 = 2826.22m$

$$KM = MT_2 + KT_1 = 3574.24 + 2826.22$$

$$= 6400.46m$$

Now,

Finding $\Delta BKM$ By Sine Rule

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

$$= \frac{6400.46m \sin 40^\circ}{\sin 90^\circ}$$

$$= \frac{6400.46 \times 0.642}{1}$$

$$= 4109.09\ m$$

$$BM = \frac{MK \sin\alpha}{\sin(I)}$$

$$= \frac{6400.46m \times \sin 50^\circ}{\sin 90^\circ}$$

$$= \frac{6400.46 \times 0.766}{1}$$

$$= 4902.75 \text{ m}$$

$T_L = KT_1 + BK$

$= 3574.24 + 4109.09 \quad = 7683.33 \text{ m}$

$T_S = MT_2 + BM$

$= 2826.22 + 4902.75 \quad = 7728.97 \text{ m}$

$$L_L = \frac{\pi R_L \alpha}{180^\circ}$$

$$= \frac{3.1415 \times 7665 \times 50^\circ}{180^\circ} \quad = 6688.7 \text{ m}$$

$$L_S = \frac{\pi R_S \beta}{180^\circ}$$

$$= \frac{3.1415 \times 7765 \times 40^\circ}{180^\circ} \quad = 5420.8 \text{ m}$$

Chainage of Intersection point,

$= 7565 \text{ m}$

Chainage of $(T_1)$ = Chainage of Inter $- T_L$

$= 7565 - 7683.3$

$= -118.3 \text{ m}$

plus $L_L = -118.3 + 6688.7$

$= 6570.4 \text{ m}$

Chainage of Compound Curvature,

plus $L_s$ = 5420.8 + 6570.4

$(T_2)$ = 11991.2 m