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Department : Btech Civil

ID : 6829

Subject : Surveying 2

Midterm Exam

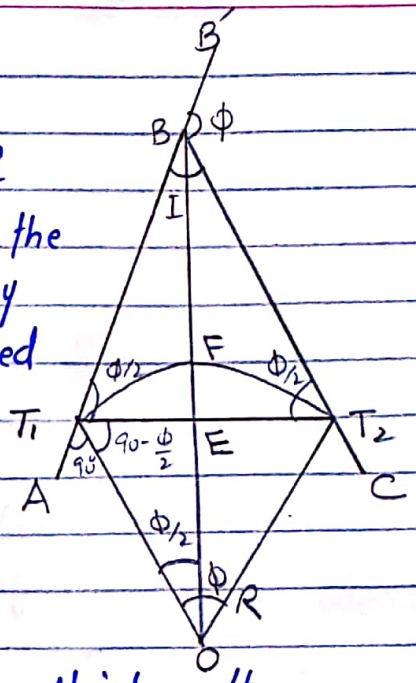
Date 22/08/2020

QNO1

Ans:

Central Angle:

The angle of T_1OT_2, Subtended at the Centre of the Curve by the arc T_1FT_2 is called Central Angle and is equal to the deflection Angle.



Deflection Angle: (ϕ)

The Angle BB'C by which the foward head tangent deflect from the Rear tangent.

Angle of Intersection:

The angle ABC between the tangent lines AB and BC. Denoted by I.

Q No 2

Given data:

=> Chainage of intersection point = 5+35.57

=> Radius of Curve = R = 8000 ft

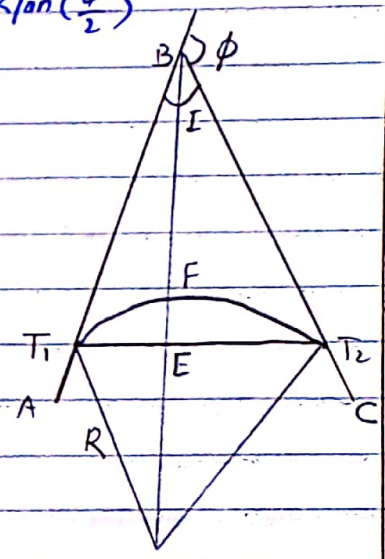
=> Deflection Angle = ϕ = 16°48'

Required data:

Chainage of tangents points = ?

Solution:

Tangent length = $BT_1 = BT_2 = R\tan(\frac{\phi}{2})$



$\Rightarrow BT_1 = BT_2 = 8000 \times \tan\left(\frac{16°48'}{2}\right)$

$= 1181.34$ ft

Length of Curve = $L = \frac{\pi R \phi}{180°}$

$\Rightarrow L = \frac{\pi \times 8000 \times 16°48'}{180°}$

$\Rightarrow L = 2345.73'$

Chainage of T_1 = (5+35.57) − (11+81.34)

$= -645.77'$

Chainage of T_2 = −645.77 + 2345.73

$= 1699.96'$

Note:- Here R = 8000 ft which is same given move (BT) if it 800 ft then it gives wright values

Sir, please Seen this problem in Q2.
if R = 800 ft. then it give following values.

$$BT_1 = BT_2 = 800 \times \tan\left(\frac{16°48'}{2}\right)$$
$$= 118.14 \text{ ft}$$

$$L = \frac{\pi \times 800 \times 16°48'}{180°}$$

$$\boxed{L = 234.57 \text{ ft}}$$

Chainge of T_1 = ch. of L - Tangent length
= 535.57 − 118.14 ft

$$\boxed{\text{ch. of } T_1 = 417.43 \text{ ft}}$$

Chainage of T_2 = ch. of T_1 + Length of Curve.
= 417.43 + 234.57

$$\boxed{\text{ch. of } T_2 = 652 \text{ ft}}$$

Q No 3

Ans:-

Camber vs Superelevation

Camber is the slope provided to the road surface in the transverse direction to drain off the rainwater from the road surface.

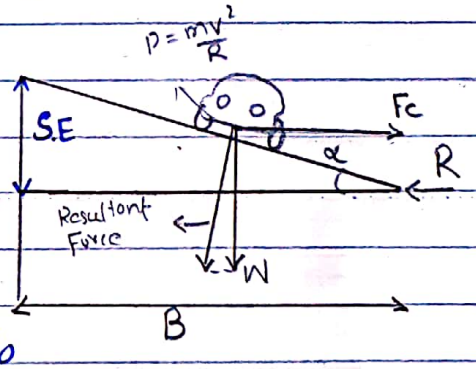
While Superelevation is when roads are designed to slop towards the inside of a curve to give vehicle going around the curve a more powerful grip.

Calculation of Super elevation of Curve:

When vehicle moves from tangent on to the curve the forces acting on it are:

* Weight of vehicle
* Centrifigual force,

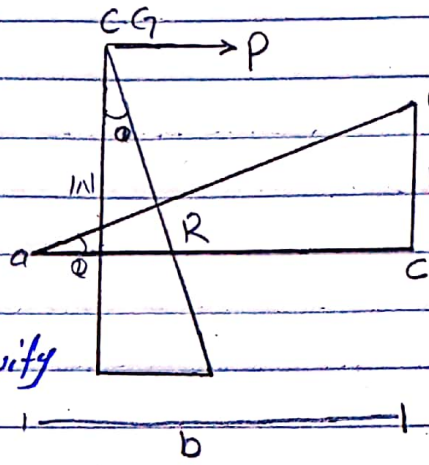
Both acting through the centre of gravity of the vehicle.



The effect of the Centrifigul force is to push the vehicle of the rail or road. To counter act the action the outer edge of the road is raised above the raising of the outer edge of rail or road above the inner one is called Super elevation.

The amount of Super elevation depends upon:

* Speed of vehicle
* Radius of Curve.



let
W = weight of vehicle
P = Centrifigual force
V = Speed of vehicle, m/s²
g = Acceleration due to gravity m/s²

R = Radius of Curve, m
h = Superelevation, m
b = width of road.

For equilibrium the resultant "R" of the P and W must be equal and opposite to the reaction perpendicular to road or rail Surface

$$P = \frac{mv^2}{R} = \frac{WV^2}{gR} \qquad \therefore W = mg$$

$$\frac{P}{W} = \frac{V^2}{gR}$$

$$\tan\theta = \frac{h}{b} = \frac{dc}{ac} = \frac{P}{W}$$

$$\tan\theta = \frac{h}{b} = \frac{P}{W} = \frac{V^2}{gR}$$

$$h = b \tan\theta$$

$$h = b\frac{V^2}{gR} \longrightarrow \text{on highway}$$

$$h = b\frac{GV^2}{gR} \longrightarrow \text{on railway.}$$

Where G = Distance b/w centre of the rail.

Super elevation is gradually applied along a transition curve.
Full Super elevation is attained at junction of the transition curve with Circular Curve.

Q NO 4

Given data:

=> (a) +0.7% and −0.5%, rate of change of grade is 0.15 per 40 m.

=> (b) −0.6% and +0.9% rate of change of grade is 0.1 per 32 m.

Required data:

=> Length of vertical Curve = L = ?

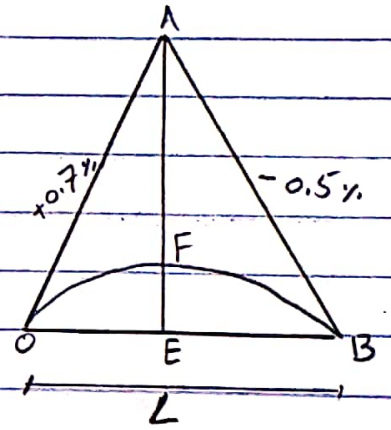
Solution:

=> (a)

$$\Rightarrow L = \frac{(g_1\% - g_2\%)}{r\%}$$

$$= \frac{(0.7 - (-0.5))}{0.15} \times 40$$

$$\Rightarrow \boxed{L = 320\,m}$$

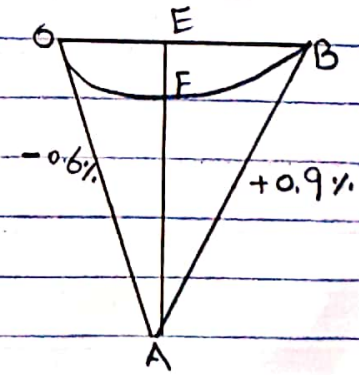


(a)

=> (b)

$$\Rightarrow L = \frac{(-0.6 - (+0.9))}{0.1} \times 32$$

$$\Rightarrow \boxed{L = -480\,m = 480\,m}$$



Here negative sign shows that the curve are Sag.