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Paper Survey II

(Q 1) What is the difference between Central angle. angle of deflection and angle of intersection:-

* **Central angle:-**

The angle $\overline{T_1}$ O$\overline{T_2}$ subtended at the center of the curve by the arc T_1 FT_2 is called central angle and is equal to the deflection angle.

* **Angle of deflection:: (Ø):**

Then angle B'Bc by which the forward (head tangent deflect from the Rear tangent.

* **angle of intersection: (I)**

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

(Q2) Two tangents intersect at chainage of 6+ 26.57. It is proposed to insert a circular curve of radius 1000ft. The deflection angle being 16°38', calculate:-

(a) Chainage of tangent points.

(b) Lengths of long chord, Mid ordinate and External distance.

(Solution)

Tangent length = $BT_1 = BT_2 = R \tan\left(\frac{\Delta}{2}\right)$

$BT_1 = BT_2 = 1000 \times \tan(16°38'/2)$

$= 146.18 Ft$

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

$L = \frac{\pi \times 1000 \times 16°38'}{180°} = 290.31 Ft$

Chainage of point of intersection	= 6 + 26.56
minus tangent length	= -1 + 46.18
Chainage of T_1	= 4 + 80.39
Plus L.	= +2 + 90.31
Chainage of T_2	= 7 + 70.70

Problem 01:-

Solution:

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

$l = 2 \times 1000 \times \sin(36° 38'/2) = 289.29\,ft$

Mid ordinate $= EF = R\left(1 - \cos\left(\frac{\Phi}{2}\right)\right)$

$EF = 1000 \times (1 - \cos(36° 38'/2)) = 10.52\,Ft$

Ex distance $= BF = R * \left(\sec\left(\frac{\Phi}{2}\right) - 1\right)$

$BF = 1000 \times ((1/\cos\left(\frac{\Phi}{2}\right) - 1) = 10.63\,Ft.$

(Q3) What is the difference b/w camber and super elevation? How can we calculate the super-elevation of a curve?

* Camber :-

- A slight convexity, arching or curvature of a surface of a road, a beam, roof deck, ships, deck etc. so that liquids will flow off the sides.
- The slope of a curved road created to minimize the effect of centrifugal force.
- The curvature of an airfoil
- (architecture) An upward concavity in the underside of a beam, girder, or lintel; also, a slight upward concavity in a straight arch.
- (automotive) A vertical alignment of the wheels of road vehicle with positive camber signifying that the wheels are closer together bottom than top.

* Super elevation:-

is the banking of a roadway along a horizontal Curve so motorists can safely and comfortably maneuver the curve at reasonable speeds. A steeper superelevation rate is required as speeds increase or horizontal Curves beome tighter. Definitions.

* How to Calculate super elevation?

1) 4 Lane rural design
2) Design speed 30MPH
3) Curve Radius 261ft.

Find L.

use Std. Dwg. RDII-LR-1, minimum Runoff Lengths of urban Highways. Emax = 0.04. From the table, ed = 3% this is the minimum rate of radius.

According to the table on RD 11-LR-1, LR is 82 Feet.

According to the superelevation Transition equation on RD 11-5E-1, LT is 54.67

L= LR + LT = 82 + 54.67 = 136.67, rounded to 137 Feet.

A spiral is not required for this design speed so half of L is on either side of the P.C. or P.T. as show on.

if the P.C is at station 103+17.44:

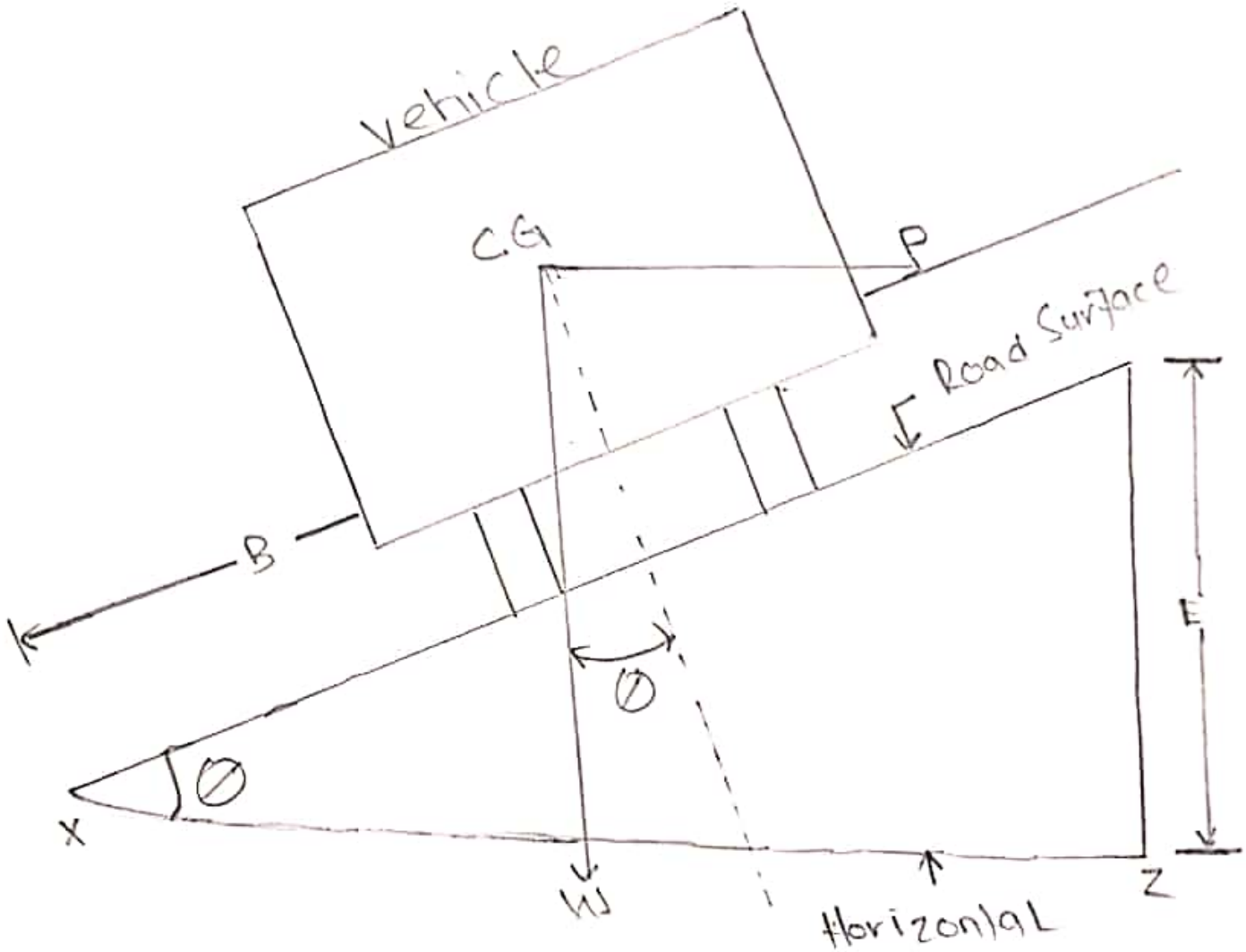
Transition begins at 10317.44 - (137/2) = 10248.94 station 102+48.94.

Remove Adverse Crow is 10248.94 + L

T = 10248.94 + 54.67 = 10303.61,

station 103+03.61

Reverse crow is 10248.94 + 2xL T = 10248.94 + 109.34 = 10358.28 Station 103+58.28



(Q4) Find the Length of vertical Curve connecting two uniform grades from the following data.

(a) + 0.7% and -0.5% rate of change of grade is 0.15 Per 40 m.

(Solution)

$$L = \frac{(G1\% - G2\%)}{r\%}$$

$$L = \frac{(1.7 - (+0.5))}{0.15} \times 40$$

$$L = 320 m$$

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

Solution:-

$$L = \frac{(G1\% - G2\%)}{r\%}$$

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

$$L = -480 m$$