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Section : A

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Q=No=01

Given data:

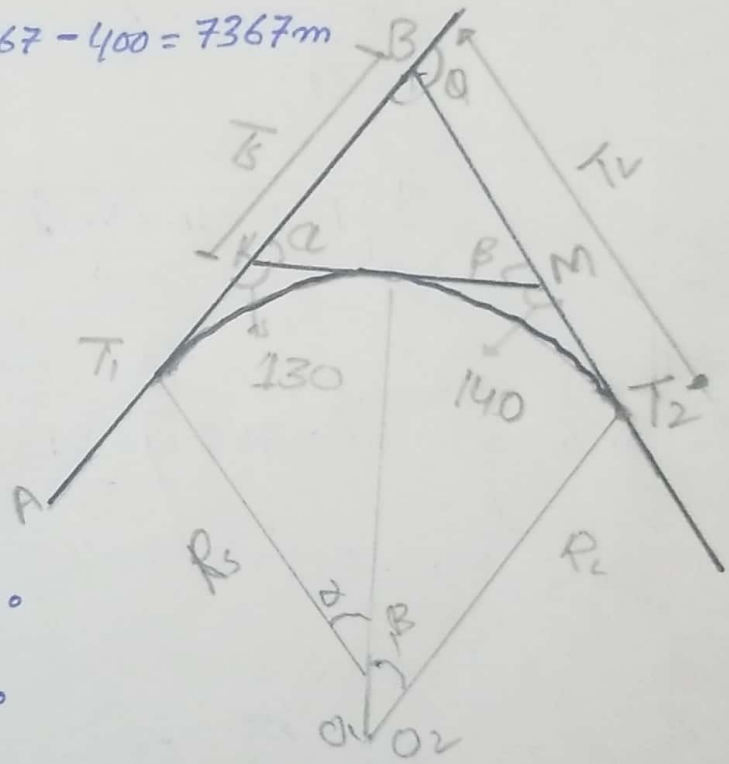
Angle AKM = 130°

Angle KMC = 140°

Radius of 1st Arc = 7767 - 300 = 7467m

Radius of 2nd Arc = 7767 - 200 = 7567m

Intersection point = 7767 - 400 = 7367m



Solution

$\alpha = 180° - 130° = 50°$

$\beta = 180° - 140° = 40°$

$\phi = \alpha + \beta = 50 + 40 = 90°$

$I = 180° - 90° = 90°$

$KT_1 = KN = R_1 \tan\left(\frac{\alpha}{2}\right) = 7467 \tan\left(\frac{50}{2}\right) = 3481.9m$

$MN = MT_2 = R_2 \tan\left(\frac{\beta}{2}\right) = 7567 \tan(40/2) = 2754.16m$

$\Rightarrow KM = KN + MN = 3481.9 + 2754.16 = 6236.06m$

(P-T-O)

⇒ Find Bk and BM by Sin Rule

$$\Rightarrow Bk = \frac{Mk \sin\beta}{\sin(I)} = \frac{6236.06 \times \sin(40)}{\sin(90^\circ)} =$$

$$\boxed{Bk = 4008m}$$

$$\Rightarrow BM = \frac{Mk \sin\alpha}{\sin I} = \frac{6236.06 \times \sin(50)}{\sin(90^\circ)} = 4777m$$

$$\boxed{BM = 4777m}$$

~~⇒ $T_L = kT_1 + Bk = 3481.9 + 2182.8 = 5664.7m$~~

⇒ $T_L = kT_1 + Bk = 3481.9 + 4008 = 7489.9m$

⇒ $T_S = MT_2 + BM = 2754.16 + 4777 = 7531.16m$

⇒ $L_L = \frac{\pi R_L \alpha}{180^\circ} = \frac{\pi \times 7467 \times 50}{180} = 6516m$

$$\boxed{L_L = 6516m}$$

⇒ $L_S = \frac{\pi R_S \beta}{180} = \frac{\pi \times 7567 \times 40}{180} =$ 5282.7m

$$\boxed{L_S = 5282.7m}$$

As we have Intersection point is 7367m

Now P.I - T_L = 7367 - 7489.9 = -122.9m

Chainage of T_1 = 7244.1m

Chainage of $T_1 + L_1$ = 7244.1 + 6516 = 13760.1m

Now chainage of Compound Curve (CV) + Ls

= 13760.1 + 5282.7 = 19042.8m

Chainage of T_2 = 19042.8m

Q=No=02

Ans:

Transition Curves: A Curve of varying radius is called a transition Curve. It is also called Spiral Curve or Easement Curve.

→ It is used on both highway and railway b/w tangent and a circular Curve in order to have a Smooth transition from tangent to the Curve and from Curve to the tangent.

→ It is also Inserted b/w two branches of Compound.

How Super Elevation is Effected:

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

- Weight of the vehical
- Centrifugal force, Both acting through the Center of gravity of the vehicle.

The effect of the centrifugal force is to push the vehicle off the rail or road.

To counter act the action the outer rail or outer edge of the road is raised above the raising of outer edge of rail or road above the inner one is called Super elevation or Cant.

The amount of Super elevation depend upon

- Speed of the vehicle
- Radius of the vehicle.

Prove with the help of equation:

Let

W = weight of the vehicle

P = Centrifugal force

V = Speed of the vehicle, m/s

g = Acceleration due to gravity, m/s^2

R = Radius of the Curve, m

h = Super elevation, m

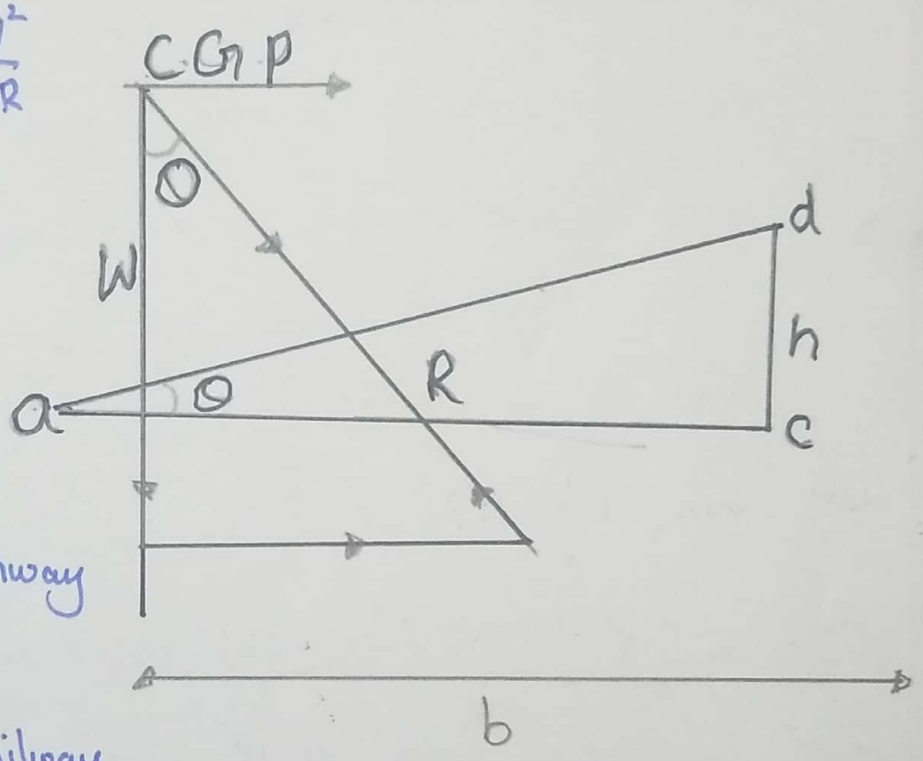
b = width of the road, m

(P-T-O)

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

$$P = \frac{mv^2}{R} = \frac{Wv^2}{gR} \qquad \because W = mg$$

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



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

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

$$h = b\tan\theta$$

$$h = b\frac{v^2}{gR} \quad \text{— on highway}$$

$$h = b\frac{Gv^2}{gR} \quad \text{— on railway}$$

Where G = Distance b/w the 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 the Circular Curve.

Q=No=03

Answer:

	Triangulation	Triteration
(1)	All angles are measured in triangulation	(1) All sides are measured in triteration
(2)	(1) Distance of base line is measured	(2) Azimuth of the Initial line is measured
(3)	Inter-Visibility blw station is essential	(3) For Small area it is possible to measure distance without Intervisibility
(4)	Some check base line are also measured to Control Scale error	(4) Some check angles are measured to Control azimuth error
(5)	There are more Internal checks in Comparison with trilateration in the Some geomatric figure	(5) There are less Internal checks in Comparison with ~~trieng~~ triangulation in the Same geomatric figure
(6)	The side length are Computed on the basis of measured angle applying Sine law	(6) The angles are Computed on the basis of measured Side length applying Cosine law.

Q = No = 07 = part-B

principle of triangulation:

1. If all the three angles and the length of one side of a triangle are known, then by trigonometry the length of the remaining sides of the triangle can be calculated.

2. Again, if the coordinates of any vertex of the triangle and azimuth of any side are also known, then coordinates of the remaining vertice may be computed

Sine Rule:

$$\frac{a}{\sin(A)} = \frac{b}{\sin(B)} = \frac{c}{\sin(c)} \quad \text{(for finding sides)}$$

$$\frac{\sin(A)}{a} = \frac{\sin(B)}{b} = \frac{\sin(c)}{c} \quad \text{(for finding Angle)}$$

Q=No=03 - part-B

Principle of trilateration:

(1) Trilateration is a highly accurate and precise method of establishing and expanding horizontal Control.

2 Method of Control Survey in which a network of triangles is used as in triangulation System.

3 All the three Side of each triangle are measured in the field with the distance measuring Instrument (EDMS, tapes etc)

4 Horizontal angles are not measured in the field

5 Angle in the trilateration system are Computed indirectly from the length of the Side of triangle by Cosine formula

6 Few horizontal angle are also Sometimes measured to provide a check on Computed angle

7 Trilateration is adjusted after the Computation of the angles and than co-ordinates of the System are determined.

(P-T-O)

8 Verticle angle are also measured where elevations have not been established.

Cosine Rule:

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$2bc\cos A = b^2 + c^2 - a^2$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$A = \cos^{-1}\left[\frac{b^2 + c^2 - a^2}{2bc}\right]$$

Q=No#04

Ans Hydrographic Survey:

It is the branch of Surveying which deals with water bodies e.g lake, river etc

The usual fundamental Principles of Surveying and levelling are adopted for aquiring data for determination of

1. Water Volume
2. Rate of flow
3. To determine the Shape of the area underlying the water Surface etc.

Why We do-it?

Ans To determine the quantities of Subaqueous excavations

2. Measure areas Subjected to Scouring or Silting in harbous or docks

3. Locate rocks and other objects Such as buoys, light etc to aid Safe navigation.

4. To Prepare navigation charts exihibiting the depths available for navigation.

(P-T-O)

5. Control floods, and to plan water Supply and Storage from divers

6. To develop water, resources for power irrigation and recreation.

⇒ Factor of Hydrographic Survey:

1. To measurement of depth of water at various point is termed as Sounding

2. (1) Depth of Sounding is refferred to the water level at the time it is made.

3. Thereafter, the Sounding are reduced to datum water level to account for tidal water which undergo Continual Change of elevation, with the help of gauges

4. A number of benchmarks (B.M) are established at frequent Intervals ~~an~~along Shore lines, and gauges are Set on them.

(P.T.O)

5. The field work Consist of both horizental as well as vertical Control.

6. The horizental Control is established by traverssing or triangulation.

7. For verticle Control, the tide gauge are kept in operation Comtinuously Since the water level at that gauge must also be known when Sounding are recordeel.

Ans **Sounding:** The process of determing depth below water surface is called Sounding.

Sounding is analogous to levelling on land.

To reduce level of any point on the bottom of a water body is obtained by Subtracting the Sounding from the mean sea level.

Purpose of Sounding.

1. Preparation of accurate charts for navigation
2. Determination of the quantities of the materials to be filled
3. Obtaining Information for design of break waters, sea wells etc

Equipments: The following are the equipments used to determine Sounding

1. Shore Signals and buoys
2. Sounding equipment
3. Angle measuring Instrument.

Q = No = 05 → part [A]

(16) (15)

Ans Aerial Photogrammetry:

Aerial Photogrammtry Involve the use of Photograph taken in a systematic manner from the air. They are them Controlled by land Survey and measure by photographic techniques Since the 1st world user the terrestrial Photographic Surveying has been replaced by aerial Photographic Surveying due to the development of the aeroplane.

Why we do it?

Ans The Survey work Can be Carried out with great Speed

2 It Can be used with great Sucess for other purposes i-e Classification of Land or Soil, geological or archeological Investigation etc

3 Aerial Survey is highly technical and Specialized work & must be Carried out Stilled trained & experience person.

4 It is mainly made by government organization e.g Survey of Pakistan (1) Department.

Q = No #05 - part-B

1. Verify that the weather Condition are Suitable for flying. Flying under Condition of low visibility or potential Strong turbulence Should be avoided. Bad weather Conditions Could not only produce unacceptable Photographic result, but also risk the flying Crew.

2. Mount the aerial Camera according to the established procedure

3. Test the Camera to ensure that it function properly. ~~to Plans.~~

4. Fly the designed routes and take the Photographs according to Plans.

5. Process the film according to Specification to ensure radiometrically and geometrically quality images.

6. If necessary, print on the negative the missing photo ~~for~~ Information, Such as Serial number, date, project Information etc.

7. prepare Contact Prints from the negatives, If necessary, prepare enlargements to be used later, according to the project requirement.

8. Select Photographs that will be used for data Compilation and develop for them.