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Submitted To:

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Q1 What is transition curve? How Super elevation is effected by the Speed of vehicle and radius of the curve? Prove it with the help of equation and diagram.

Ans: Transition curve...

A Curve of Varying radius is called transition curve. It is also called spiral curve. It is used in both highway and railway b/w tangent and circular curve in order to have smooth transition from tangent to the curve and from curve to the tangent.

It is also inserted b/w two branches of compound curve.

* \Rightarrow When vehical moves from tangent on to the curve the forces acting on it is an.

- * weight of the vehical
- * Gravity of the vehical.

Let

w = weight of vehicale.

P = centrifugal forces

v = space of vehical m/s

g = Acceleration due to gravity

R = Radius of the curve

h = Super elevation

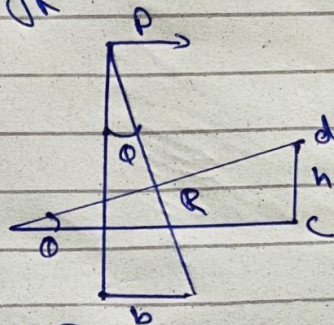
b = width of the road.

③

For equilibrium the resultant R of the P and w must be equal and opposite to the reaction perpendicular to the road or rail surface.

$$P = \frac{mv^2}{R} \quad \frac{wv^2}{gR} \quad w = mg$$

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



$$\tan \phi = \frac{h}{b} = \frac{dc}{ac} = \frac{P}{w}$$

$$\tan \phi = \frac{h}{b} = \frac{P}{w} = \frac{v^2}{gR}$$

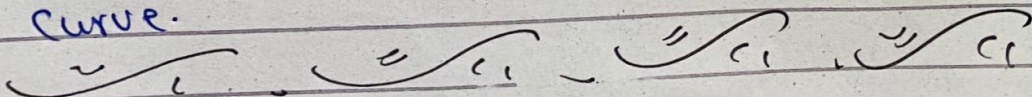
$$h = b \tan \phi$$

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

$$h = \frac{b G v^2}{gR} \rightarrow \text{on railway}$$

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

~~Super~~ Super elevation is gradually applied along a transition curve. Full Super elevation is attained in junction of the transition curve with the circular curve.



Q2 What is the difference b/w triangulation and Trilateration? Also explain the Principles of triangulation & trilateration.

Ans:

Triangulation	Trilateration
① All angles are measured in triangulation.	① All Sides are measured in trilateration.
② Distance of baseline is measured.	② Azimuth of the initial line is measured.
③ Some Check base lines are also measured to control Scale error.	③ Some Check angles are measured to control azimuth error.
④ Intervisibility b/w station is essential.	④ For small areas its possible to measure distance without intervisibility.
⑤ There are more internal checks in comparison with trilateration in the same geometric fig.	⑤ There are less internal checks in comparison with triangulation in the same geometric figure.
⑥ The Side lengths are computed on the basis of measured angles applying sine law.	⑥ The angles are computed on the basis of measured side length applying cosine law.

* Principles of triangulation.

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

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

* Principles of trilateration.

⇒ Trilateration is a highly accurate & precise method of establishing and expanding horizontal control.

⇒ Method of control survey in which a network of triangles is used as in triangulation system.

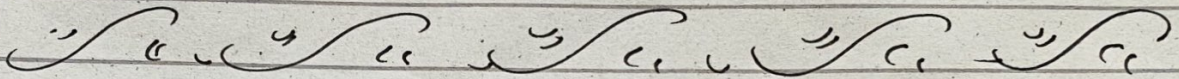
⇒ Horizontal angles are not measured in the field.

⇒ Angle in trilateration system are computed indirectly from the length of the sides of triangle by cosine formula.

⇒ Few horizontal angles are also sometime measured to provide a check on computed angles.

⇒ Trilateration is adjusted after the computation of the angles and then coordinates of the stations are determined.

⇒ Vertical angle are also measured where elevations have not been established.



Q3A: What is hydrographic Survey? Why we do it and what are the factors to be determined while conducting hydrographic Survey?

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 leveling are adopted for acquiring data for determination:

- ① water volume
- ② Rate of flow
- ③ To determine the shape of the area underlying the water surface etc.

* Why we do hydrographic Survey.

In order to get following information we do hydrographic Surveying.

- (1) Depth of bed can be determined.
- (2) Shore lines can be determined.
- (3) Locating sewer fact by measuring direct current.
- (4) Locating mean sea level.
- (5) Tide measurement
- (6) River and stream discharge measurement
- (7) Massive structures like bridges, dams harbors are planned.

* Factor to be determined while conducting hydrographic Survey:

Following are the factor which would be done while doing and conducting hydrographic Survey.

- (1) Survey Equipment
- (2) Preparation of hydrographic Survey specification (To include a review of existing data)
- (3) Issue to designated unit.
- (4) Programme planning of that unit.
- (5) Reconnaissance requirement.
- (6) Detailed Survey Planning.
- (7) Plans for compilation and checking of data.

(Q3B). What is Sounding and Purpose of sounding. Also name the equipment used to determine Sounding.

Ans: Sounding:

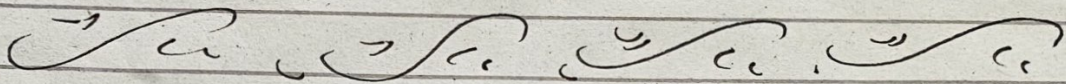
- (1). The Process of determining depth below the water surface is called Sounding.
- (2) Sounding is analogous to leveling on land.
- (3) The reduce level of any point on the bottom of a water body is obtained by subtracting the Sounding from the mean sea level.
- (4) The sounding points should be selected keeping in mind that all the important ~~irregularities~~ irregularities are recorded.
- (5) The soundings are thus made along a series of straight lines at right angles to the shoreline.
- (6) Usually spacing b/w sounding lines is kept 30m and spacing b/w sounding points is kept 7.5m to 15m.

* Purpose for Sounding.

- (1) Preparation of accurate charts for navigation.
- (2) Determination of the quantities of the material to be filled.
- (3) obtaining information for design of breakwater, sea, wells etc.

* Sounding Equipment.

- ① Sounding boat
- ② Sounding Pole or rod
- ③ Lead line
- ④ Weddell's Sounding machine
- ⑤ Echo Sounding machine / Fathometer.



Q4 A: What is aerial photogrammetry and why we do it?

Ans: Aerial Photogrammetry:

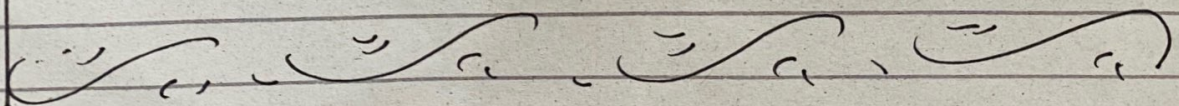
In terrestrial photogrammetry photographs are taken from a fixed position on ground while in the aerial photogrammetry, an aircraft camera setup is used to take photographs from the air flying over the ground. In this article we will discuss about the aerial photography.

* Why we do it.

As mentioned, sometimes it is difficult to survey a large area of land on foot. This is where UAVs come in. They make the entire process of surveying land more affordable and efficient. UAVs can fly either several hundred feet in the air or close to

to the ground, depending on the topography of the land being surveyed. Acquiring perspectives from high up is beneficial since the imagery returned will display larger part of the land all at once. However, despite the efficiency of drones, surveyors must always allow for areas that present obstacles even to UAVs.

These obstacles even could be anything from trees to dense brush. In these cases, the vehicles can fly closer to the ground, or the camera pointed at an angle to see what additional information can be gotten from the new perspective. UAV photogrammetry in land surveying has met a strong need in construction planning and management.



Q4 Part(b): Shortly explain the Procedure of aerial photography?

Ans: procedure of Aerial photography

- 1) Establishing Control points
- 2) Flight Planning & photography
- 3) Photo interpretation and stereoscopy
- 4) Parallax and measurement of Parallax.
- 5) Construction of map & cartography.

* 1) Establishing Control points.

Control points are points established on ground with known relative position. The photography captured is observed by setting these control points are boundaries. So point should be established in such way that they should be easily identifiable on photograph.

* 2) Flight Planning and photography.

Flight planning is nothing but knowing height to be maintained by flight while taking photos, area to be covered in each photography, number of photographs, no of strips and time interval b/n exposures.

*3 Photo interpretation and stereoscopy.

Photo interpretation is done by instrument called stereoscopy which contains magnifiers so, one can observe the three-dimensional model of area through it and it also ease the drawing of maps of photographed area. For accuracy, control station, elevations, length of lines should be sufficiently available.

*4. Parallax and Measurement of Parallax.

An aerial photograph can be studied to get the location of an object by its co-ordinates in the photograph.

*5. Construction of Map and Cartography.

After collecting all photographs, it's time to create or plot the map. There are several methods available to plot the details of map and one of the methods is stereoscopic method.

