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Section

A

Semister

4th

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Civil Engineering

Paper

Advance Engineering
Survey

Transition Curve:

A curve of varying radius is called transition curve between tangent and a circular curve. It is also known as spiral curve. It can be inserted in between the two branches of a compound reverse curve.

Types:

There are three types of transition curve which are given below.

- i) Cubic parabola (railways)
- ii) clothoid or spiral (railways)
- iii) lamniscate (Highways)

Superelevation :

It is the amount by which the outer edge of a curve on a road or railway is banked above the inner edge when a vehicle passes to a curved path,

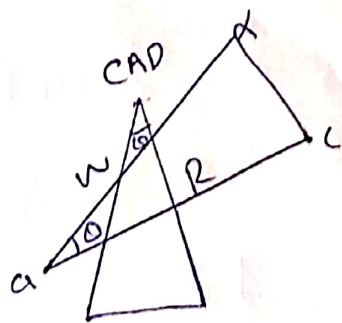
The following forces acts on it.

- i) Weight of vehicle
- ii) Centrifugal force both acting through centre of gravity of vehicle.

The effect of centrifugal force is to push the vehicle off the track. Now to counteract the action, the plane of the road

Surface is made perpendicular to resultant of centrifugal force and weight of vehicle. In other words the outer bank of road is raised above the inner one. This raising of outer bank over the inner one is known as Super elevation.

Mathematically :



For equilibrium
The resultant of weight and centrifugal force must be equal and opposite to the reaction perpendicular to road.

- W = weight of vehicle
- P = centrifugal force
- v = speed of vehicle (m/sec)
- g = acceleration due to gravity
- R = radius of curve
- h = Super elevation in m
- b = width of road in m
- G = Distance between centre of gravity

As we know that

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

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

If θ is the inclination of road surface. the inclination of resultant the vertical is also θ .

So we have

$$\tan \theta = \frac{de}{ac} = \frac{P}{w} = \frac{b v^2}{gR}$$

On Roads :

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

On Railway :

$$b \tan \theta = \frac{G v^2}{gR}$$

Radius :

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

$$R = \frac{v^2}{b \tan \theta g} \quad (\text{for roads})$$

$$b \tan \theta = \frac{Gv^2}{gR}$$

$$R = \frac{Gv^2}{b \tan \theta} \quad (\text{for railways})$$

Speed of vehicle :

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

$$v^2 = b \tan \theta gR$$

$$v = \sqrt{b \tan \theta gR}$$

(for roads)

$$b \tan \theta = \frac{Gv^2}{gR}$$

$$v^2 = \frac{b \tan \theta gR}{G}$$

$$v = \sqrt{\frac{b \tan \theta gR}{G}}$$

(for railways)



Triangulation:

Triangulation is a process in surveying in which tracing and measurements of a series of a network of triangle is used for determining distances and relative positions of points over an area.

Principles of Triangulation:

* In triangulations, all the three angles of each triangle are in the field along with one base line.

* The side of the first triangle whose length is predetermined is called

base line, and vertices of the individual triangles are known as triangulation Stations.

★ To minimize accumulation of errors in lengths. Subsidiary bases at suitable intervals are provided.

(b) Trilateration :

The method of surveying in which the length of the sides of a triangles are measured and from this information angles are computed

This method does not involve the measurements of angles.

Principles of triangulation:

- * It is a method of control survey in which a network of triangles is used as in triangulation.
- * All the three sides of each triangle in the field are measured with distance measuring instruments.
- * Horizontal angles are measured in the field.
- * Triangulation is adjusted after the computation of the angles and then the co-ordinates of the stations are determined.
- * In triangulation, angles are computed indirectly from the length of the sides of triangles.

Difference b/w triangulation
and trilaterations:

Triangulation:

- i) All angles are measured in triangulation.
- ii) Distance of base line is measured.
- iii) Some check base lines are also measured to control scale error.
- iv) Intervisibility between stations is essential.
- v) These are more internal checks in comparison with trilateration in the same geometric figure.

Trilateration :

- i) All sides are measured in trilateration.
- ii) Azimuth of the initial line is measured.
- iii) Some check angles are measured to control azimuth error.
- iv) For small areas it is possible to measure distances without intervisibility.
- v) There are less internal checks in comparison with triangulation in the same geometric figure.

Hydrographic Survey :

Hydrographic Surveying is the survey of physical features present under water. It is the science of measuring all factors beneath water that affect all the marine activities like dredging, Marine construction off shore drilling etc.

Hydrographic Surveying is mainly conducted under authority concern. It is mainly carried by means of sensor, sounding or electronic sensor system for shallow water.

Why we do Hydrographic

Surveying :

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 surface current by measuring direct current.
- 4) locating mean sea level.
- 5) Tide measurement.
- 6) River and stream discharge measurement.
- 7) Massive structures like bridges, dams, harbor's are planned.

⇒ Factors to be determined while conducted Hydrographic

Survey :-

Following are the factors which would be done while doing and conducting Hydrographic Surveying.

- a) Survey Equipment
- b) Preparation of a Hydrographic Survey Specification. (To include a review of existing data)
- c) Issue to a designated unit.
- d) Program planning of that unit
- e) Assessment of the test with in that unit.
- f) Resource allocation.
- g) Detailed Survey planning.

Sounding :

The measurement of depth below the water surface is called sounding. This corresponds to the ordinary spirit leveling in land surveying where depth are measured below horizontal line establish by level. The object of making sounding in thus to determine the configuration of the sub aqueous source.

Purpose of Sounding :
=> Sounding is the most important for any water body to improve its negligible properties to know about silting and scouring etc

⇒ In Hydrographic Surveying Sounding is the measurement of depth below the water surface.

⇒ In short the main purpose and objective of sounding is to measure and find the depth below the water surface.

Equipment :

- i) Sounding boat
- ii) Sounding rods and poles
- iii) lead lines
- iv) Sounding machine
- v) fathometer



Q No 04 (part - a)

Aerial

Photogrammetry :

Aerial
Process
Craft
to
certain
A
points
graph.

Photogrammetry is
in which an air-
with camera is used
take photograph from
height in the air.
A minimum 3 to 4 control
needed in one photo-

Reasons for use of Aerial

Photogrammetry :

Following are some of the
reasons for use of Aerial
photogrammetry.

It is used because it provides computer generated 2D and 3D models. These models are topographical in nature, They represent the physical features in dimensions and physical features of the area of the land and in stunning accuracy, These model can be rotated and zoomed.

Along with surveying may of the uses of Aerial photo-grammetry in different fields.

Procedure of Aerial Photography:

Following are the main steps of Aerial photography.

- Establishing control points
- Flight planning and photography
- Photointerpretation and stereoscopy
- parallax and measurement of parallax
- Construction of map and cartography.

Establishing Control Points:

Control points are points established on ground with known relative positions. The photography captured is observed by setting these control points as boundaries. There should be minimum 3 to 4 points in a photography.

Flight Plainning and Photography

flight plainning is actually knowing the height to be maintained while taking photos, area to be covered in each photograph, Number of photograph, No of strips and time interval between exposures.



The End