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SECTION

A

PAPER

ADVANCE ENGT'G - SURVEY

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ANSWER TO QUESTION NO 1

⇒ We will explain Transition curve & its Super elevation is effected by speed of vehicles....

★ TRANSITION CURVE

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

★ TYPES :-

There are three common types of transition curves which are given below.

- i- Cubic Parabola [railways.
- ii- clothoid or spiral [railways
- iii- lemniscate [Highway

SUPERELEVATION 80

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 act on it.

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

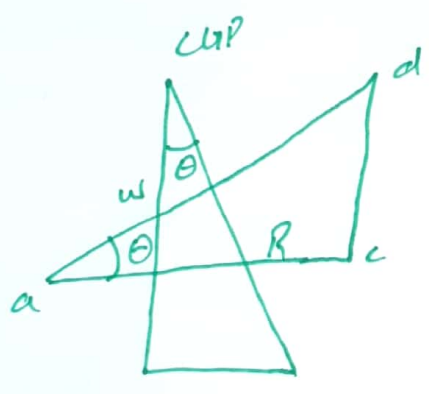
→ The effect of centrifugal force is the push the vehicle off the track. Now to counteract the action,

the plane of the road surface is made perpendicular to resultant of centrifugal force & weight of vehicle.

In other side the outer bank of road is raised above the inner one.

This raising of outer bank over the inner one is known as Superelevation.

MATHEMATICALLY: 0



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 b/w center of rails.

For equilibrium :-

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

As we know that .

$$P = \frac{Wv^2}{gR}$$

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

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

So we have.

$$\tan \theta = \frac{dc}{ac} = \frac{P}{W} = \frac{bv^2}{gR}$$

→ On Roads

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

on Railways :-

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

RADIUS:0

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

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

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

$$R = \frac{L v^2}{b \tan \theta} \quad (\text{For railways})$$

SPEED OF VEHICLE:0

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

$$v^2 = b \tan \theta g R$$

$$v = \sqrt{b \tan \theta g R} \quad \underline{\text{For Roads}}$$

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

$$v^2 = \frac{b \tan \theta g R}{L}$$

$$v = \sqrt{\frac{b \tan \theta g R}{L}} \rightarrow \text{For railways} \quad x-x$$

ANSWER TO QUESTION NO 02:0

TRIANGULATION:0

Triangulation is a process in Surveying in which tracing & measurement of a series or a network of triangle is used for determining distance and relative position of points over an area.

PRINCIPLES OF TRIANGULATION:0

- In triangulation 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.
- ∴ vertices of the individual triangles are known as triangulation stations.

→ To minimize accumulation of errors in length subsidiary bases at suitable intervals are provided.

(B) TRILETATION

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

→ This method does not involve the measurement of angles.

PRINCIPLES OF TRILETATION

→ 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 are measured in the field.

→ with distance measuring instrument.

→ Horizontal angles are measure in the field.

→ Trilateration is adjusted after the Computation of the angles and then co-ordinates of the Stations are determined.

→ In trilateration angles are Computed Indirectly from the length of the Sides of triangles.

Difference between triangulation and trilateration:

- ① In triangulation, All angles of the triangle are measured.
- ② In triangulation, base line is measured while in trilateration Azimuth of initial line is measured.
- ③ For triangulation, intervisibility between Stations are essential while In trilateration, it is possible to measure distance without intervisibility.

④ There are more internal checks in triangles (pg) as compared to that of trilateration.



ANSWER TO QUESTION NO 3

PART A 80

HYDROGRAPHIC SURVEY 80

Hydrographic Surveying or bathymetric Surveying is the Survey of physical features present under water. It is Science of measuring all factors beneath water that ~~after~~ affect all the marine activities like dredging, Marine construction offshore drilling etc.

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

Sounding or electronic Sensor System for Shallow water.

(p10)

* Why we do Hydrographic Surveying so

In order to get following information we do hydrographic Surveying -

- (i) Depth of bed can be determined.
- (ii) Shore lines can be determined
- (iii) Locating Sewer fall by measuring direct current.
- (iv) Locating mean Sea level.
- (v) Tide measurement.
- (vi) River & Stream discharge measurement.
- (vii) Massive Structure like bridges dams harbours are planned.

→ FACTORS TO BE DETERMINE WHILE CONDUCTING
HYDROGRAPHIC SURVEY:

→ Following are the factors which would be done while doing & conducting hydrographic Surveying -

- (a) Survey Equipment
- (b) Preparation of a Hydrographic Survey Specification
- (c) Issue to a designated unit.
- (d) Programme planning of that unit
- (e) assessment of the task with in that unit.
- (f) Reconnaissance requirement.
- (g) Resource allocation.
- (h) Detailed Survey planning
- (i) plans for compilation & checking of data.

PART B :-

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 this to determine the configuration of the subaqueous source.

⇒ PURPOSE OF SOUNDING :-

- Sounding is most important for any water body to improve its negligible properties. to know about Silting & Scouring etc.
- In Hydrographics Surveying Sounding is the measurement of depth below the water surface -
- In Short the main purpose & objective

of Sounding to measure and finding the depth (P13)
below the water surface.

⇒ EQUIPMENT

- i- Sounding boat.
- ii- Sounding rods & poles.
- iii- Lead lines.
- iv- Sounding Machine.
- v- Fathometer.

PART A:

AERIAL PHOTOGRAMMETRY:0

Aerial photogrammetry is process in which an aircraft with camera is used to take photograph from certain height in the air. A minimum 3 to 4 control points needed in are photograph.

REASONS FOR USES OF AERIAL PHOTOGRAMMETRY:0

Following are some of the reason for uses of aerial photogrammetry-

- It is used because it provides computer generated 2D & 3D models. These models are the dimension & physical feature of the area of land & in stuning accuracy
- These model can be related & zoomed
- Along with serving many of the uses of Aerial photogrammetry in different fields.

PART B :: PROCEDURE OF AERIAL PHOTOGRAPHY ::

(PIS)

Following are the main steps of Aerial photography

- Establishing Control points.
- Flight planning & photography.
- Photointerpretation & Stereoscopy.
- Parallax and measurement of parallax.
- Construction of map & 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 photograph.

FLIGHT PLANNING AND PHOTOGRAPHY ::

Flight Planning is actually knowing the height to be maintained while taking photo, area to be covered in each photograph, Number of photographs, no of

PHOTO , INTERPRETATION AND STEREOSCOPY

photo interpretation is done by stereoscope which contain magnifiers, we can observe the three dimensional model of area & easily. we can go for drawing of maps of photo graphed area.

For Accuracy, control station, elevation length of lines should be available.

