

ADVANCED ENGINEERING SURVEYING

FINAL TERM

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SECTION:

"A"

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QUESTION #1 :-

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?

ANSWER :-

TRANSITION CURVE :-

Transition curve is also known as spiral curve.

A transition curve is curve of varying radius between tangent and a circular curve.

It can be inserted in between two branches of a compound or reverse curve.

TYPES OF TRANSITION CURVE :-

There are three common types

- i) Cubic Parabola
- ii) Spiral or clothoid
- iii) Lemniscate

Examples are railways and highways.

SUPERELEVATION:

Superelevation 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,

Following forces acting on it,

- * Weight of vehicle
- * Centrifugal force both acting through center of gravity of vehicle.

The centrifugal force's effect is to push the vehicle off the track.

Now to counteract the action the plane of the road surface is made perpendicular to the resultant of centrifugal force and weight of vehicle.

The outer bank of the road is raised above the inner one.

The raising of outer edge of a road over the inner one is known as

Superelevation.

MATHEMATICALLY:

W = weight of vehicle

P = Centrifugal force

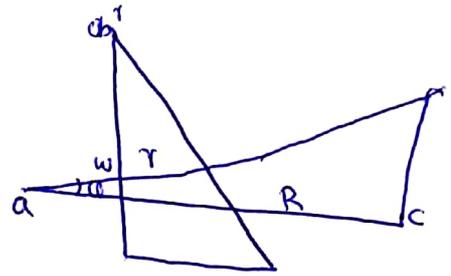
V = Speed of vehicle

g = 9.8 m/sec^2

h = superelevation in m

b = width of road in m

G = distance b/w center of rails.



FOR EQUALIBRIUM:

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

Now, we know

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

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

If ' α ' is the inclination of road surface, then inclination of resultant to vertical is also α ,

We have;

$$\tan \alpha = \frac{dc}{ac} = \frac{P}{W} = \frac{bV^2}{gR}$$

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On road:

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

On railways:

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

RADIUS:

for road:

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

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

for railways:

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

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

SPEED OF VEHICLE:

Roads:

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

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

$$V = \sqrt{b \tan \theta g R}$$

Railways:

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

$$V^2 = \frac{b \tan \theta g R}{G}$$

$$V = \sqrt{\frac{b \tan \theta g R}{G}}$$

QUESTION # 2:

What is the difference between triangulation and trilateration? Also explain the principles of triangulation and trilateration.

ANSWER:

TRIANGULATION:

Triangulation is a process in surveying in which tracing and measurements of a series or a network of triangles 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.

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- * To minimize accumulation of errors in length, subsidiary bases at suitable intervals are provided.

TRILETRATION:

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 TRILETRATION:

- * It is a method of control survey of 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 instruments.
- * Horizontal angles are measure in the field.
- * Triletration is adjusted after the computation of the angles and then coordinates of the station are determined.
- * In triletration, angles are computed indirectly from the lengths of the sides of triangles.

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DIFFERENCE BETWEEN TRIANGULATION
AND TRILETRATION:

- 1) In triangulation, all angles of the triangles are measured, while in triletration all sides of triangles are measured.
- 2) In triangulation, base line is measured while in triletration Azimuth of initial line is measured.
- 3) For triangulation, intervisibility between stations are essential while in triletration, it is possible to measure distances without intervisibility.
- 4) There are more internal checks in triangulation as compared to that of triletration.

QUESTION #3

PART (a)

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

ANSWER:

HYDROGRAPHIC SURVEY:

Hydrographic surveying or bathymetric surveying is the survey of physical features present underwater. It is science of measuring all factors beneath water that 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 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 sewer fall by measuring direct current
- 4) Locating mean sea level.
- 5) Tide measurement.
- 6) River and stream discharge measurement.
- 7) Massive structures like bridges, dams, harbours are planned.

FACTOR TO BE DETERMINED WHILE

CONDUCTING HYDROGRAPHIC SURVEY:

Following are the factors which would be done while doing and conducting hydrographic survey

- i) Survey Equipment
- ii) Preparation of a hydrographic survey specification.
- iii) Issue to a designated unit.
- iv) Programme planning of that unit.
- v) Assessment of the task within that unit.
- vi) Reconnaissance requirement.
- vii) Resource allocation.
- viii) Detailed survey planning.
- ix) Plans for compilation and checking of data.

QUESTION #3

Part (b)

What is sounding and purpose of sounding
Also name the equipments used to determine sounding?

ANSWER:

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 is. Thus to determine the configuration of the sub aqueous source.

PURPOSE OF SOUNDING:

★ Sounding is most important for any water body to improve its negligible properties, to know about silting and scouring etc.

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★ In hydrographics surveying, sounding is the measurement of depth below the water surface.

★ The main purpose and object of sounding is to measure and find the depth below the outer surface.

EQUIPMENT:

- 1) Sounding boat
- 2) Sounding rods and poles
- 3) Lead lines
- 4) Sounding Machine
- 5) Fathometer.

QUESTION # 4
Part (a)

What is aerial photogrammetry and why we do it?

ANSWER:

AERIAL PHOTOGRAMMETRY:

It is a process in which an aircraft with camera setup is used to take photograph from certain height in air.

A minimum of 3 to 4, control point needed in one photograph.

REASONS FOR USE OF AERIAL PHOTOGRAMMETRY

Following are some of the reasons for uses of aerial photogrammetry.

- * It provides computer generated 2D, 3D models. These models are topographical in nature.
- * It represents dimensions and physical features of the area of land and in stunning accuracy.
- * Along with this surveying, many of the uses of aerial photogrammetry is used different fields.

QUESTION # 4

PART (b)

Shortly explain the procedure of aerial photography?

ANSWER:

PROCEDURE OF AERIAL PHOTOGRAMMETRY:-

- * Establish control points.
- * Flight planning and photography
- * Photo interpretation and stereoscopy.
- * Parallax and measurement of parallax
- * Construction of map and cartography.

a) ESTABLISH CONTROL POINTS:

These points are of known elevations and act as boundaries for selected ground.

b) FLIGHT PLANNING AND PHOTOGRAPHY:

It is the time of decision about height which is to be maintained while taking photographs.

Area covered in photographs number of photographs etc.

c) PHOTO INTERPRETATION AND STEREOSCOPY:

Interpretation is done by stereoscopy which contain photo magnification for observing dimensional model of area so we can draw maps. Lens stereoscope, mirror, scanning mirror and zoom stereoscope are available.

d) PARALLAX AND MEASUREMENT OF PARALLAX:

Its an error, its the displacement of objects in maps.

e) CONSTRUCTION OF MAP:

After collecting all photographs we can create or plot maps.

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