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→ TRANSITION CURVE:- A curve of varying radius is called transition curve b/w tangent and a circular curve. It is also known as spiral curve. It can be inserted in b/w the two branches of a compound or reverse curve.

→ TYPES:- There are three common types of transition curves which are given below.

- 1- Cubic Parabola [railways.]
- 2- Clothoid or spiral [railways.]
- 3- Lemniscate [Highway.]

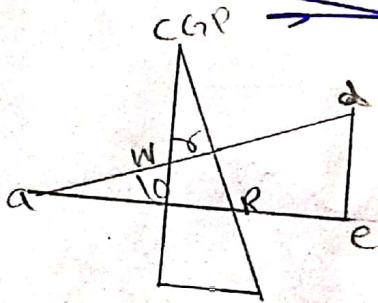
SUPERELEVATION:- It is the amount by which the outer edge of a curve on a road or railway is banked above the inner edge when a vehicle passes to a curved path, the following forces act on it.

- 1- Weight of vehicle
- 2- Centrifugal force both acting through

Center of gravity of Vehicle.

~~Q/A~~ 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 superelevation.

MATHENATICALLY :-



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

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

Ans

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 position of points over an area.

Principles of triangulation:-

- 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", and vertices of the individual triangles are known as triangulation stations.

⇒ With distance measuring instrument

- Horizontal angles are measure in the field
- Irregularity is adjusted after the computation of the angles and then coordinates of

the stations are determined.

- In trilateration, angles are computed indirectly from the lengths of the sides of triangles.
- To minimize accumulation of errors in lengths, subsidiary bases at suitable intervals are provided.

(b) Trilateration:-

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

This method does not involve the measurements of angles.

Principles of trilateration:-

- 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.

Difference blw Triangulation and Trilaterations.

- ① In triangulation, All Angles of the triangles are measured while in trilateration, all sides of triangles 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 distances without intervisibility.
- ④ There are more internal checks in triangulation as compared to that of trilateration.

✂

Q NO # 03

Part (A).

Hydrographic Survey - Hydrographic Surveying or bathymetric surveying is the survey of

Physical features present under water. It is sciences 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 harbors are planned.

⇒ Factors to be determined while conducting Hydrographic surveys:-

Following are the factors which would be done while doing and conducting Hydrographic surveyings:-

- a) Survey Equipment.
- b) Preparation of a Hydrographic Survey specification (To include a review of existing data).
- c) Issue to a designated unit.
- d) programme planning of that unit
- e) assesement of the task with in that Unit.
- f). Reconnaissance requirement.
- g). Ressure allocation.
- h) Detailed survey planning.
- i) plans for completion and checking of data.

QNo #3 (part -b)

Soundings- The measurement of depth below the water surface is called sounding. This corresponds to the ordinary spirit leveling in land surveying where depths are measured below horizontal line established by level. The object of making sounding in this is 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 and scouring etc.

⇒ In Hydrographic Surveying soundings 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 :-

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

Q No # 04 (part - a)

Aerial Photogrammetry :- 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 point needed in one photograph.

Reason for use of Aerial photogrammetry :- Following are some of the reason for uses of Aerial photogrammetry. It is used because it provides computer generated 2D and 3D models. These models are topographical in nature. They represent

The dimensions and physical feature of the area of land and in stuning accurately. These model can be rutated and zoomed.

Alag with saving may be the uses of Aerial photogrammetry in different fields.

(Part - b)

Procedue of Aerial photography: Following are the main steps of Aerial photography

- Establishus control points.
- Flight planning and photography.
- photog^{inter}raphy^{rotation} and stereoscope.
- povallax and measurement of Parllax.
- Constuction of mp and contography.

Establishing Control Points: Control points are points esteblushed on ground with know relative position. The photograph Coptured is observed by setting the control points as bundries. There should be minium 3 to 4 point (Control Point) in a photograph.

Flight planning and photography:- Flight planning is actually knowing the height to be main while taking photo area to be covered in each photograph, Number of photograph. no SF strips and time interval between exposures.