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Q No 1

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 or revere curve.

Types :

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

① cubic parabola (railways)
② clothoid or spiral (railways)
③ lemniscale (Highways)

Super evelavation :

It is the amount by which the outer edge of a curve on a road or railways is banked above the inner edge when a vehicle panes to a curved Path, the following forces acts on it.

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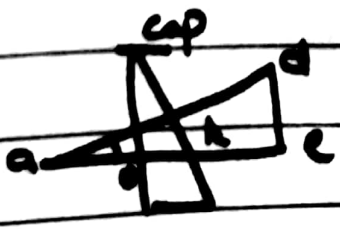
1. weight of vehicle
2. centrifugal force both acting through centre of gravity of vehicle.

The effect of centrifugal force is the push the vehicles off the track Now to contract the action. The plane of the road surface is made perpendicular to resultant of centrifugal force and weight of vehical. In otherwords the outer bank of road is raised above the inner one. The raising of outer bank over the inner on is known as Super elavation.

Mathematically:



w = weight of vehicle
P = centrifugal force
v = speed of vehical
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 rails.

for equilibrium :

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

As we know that:

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

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

resultant of vehical is also d.

$$\tan\theta = \frac{dl}{ac} = \frac{P}{w} = \frac{bv^2}{gR}$$

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

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

Radius:

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

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

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

Speed of vehicle:

$b \tan\theta = \frac{v^2}{gR}$	$b \tan\theta = \frac{Gv^2}{gR}$
$v^2 = b \tan\theta g R$	$v^2 = \frac{b \tan\theta g R}{G}$
$v = \sqrt{b \tan\theta g R}$	$v = \sqrt{\frac{b \tan\theta g R}{G}}$
for roads	for railways

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Ans:

Triangulation:

Triangulation is a process in Surveying in which tracing tracing and measurment of a Series or a network of triangle in used for determining distances and relatives positions of points over an area.

Principle 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 ~~with one to~~ is predetermined is called base line & vehicles of the individuals triangles are known as triangulation station.

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

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(b) Trilletration:

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 measurment of angles.

★ Principles of trilletration:

- 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 instruments.
- Horizontal angles are measure in the field.

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

- In trilateration angles are computed indirectly from the length of the triangles.

Difference b/w triangulation & trilateration.

1. In triangulation all angles of the triangle 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. There are more internal checks in triangulation as compared to that of trilateration.

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Q NO 3 (Part a)

ns: **Hydrographic Survey:**

Hydrographic Surveying is the survey of physical features present under water. It is science of measuring all features beneath water that effect all the marine activities like draping 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.

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⇒ Why we do Hydrographic Surveying:

In order to get following information we do Hydrographic Surveying.

1) Depth of bed can be determined
2) Share lines can be determined
3) location sewer fact by measuring D.C
4) location near sea level.
5) Tidl measurment.
6) River and stream discharge (measurement)
7) Massive structures like bridges dams harbors and planned.

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⇒ factors to be determined while conducting Hydrographic Survey:

1. Survey equipment.
2. Preparation of a Hydrographic Survey Specification.
3. Issue to a designated unit.
4. programme planning of that unit.
5. assesment of the task with in that unit.
6. Resource allocation.
7. Detailed Survey plaining.
8. Plans for compilation and ducking of data.

Part (B)

Sounding:

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

⇒ Purpose of sounding:

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

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→ In hydrographic surveying sounding is the measurment of depth below the water surface.

⇒ In short the measurment of depth below the water surface.

→ In short the mans purpose and objective of sounding to measure and finding the depth below the water surface.

→ **Equipment:**

1. Sounding boat
2. Sounding rods and poles
3. lead 's lines.
4. Sounding machine
5. fathometer.

QNO 4

(a)

Aerial photogrammetery:

Aerial photogrammetery 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:

Following are some of the reasons for uses of Aerial photogrammetery.

It is used because it is used it provides compute generated 2D and 3D models. These models are topographic in nature.

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They represent the dimension and physical features of the area land and in Sunnio accurately these models can be related and zoomed.

Along with Survey map of the uses of aerial photogrammetry in different fields.

b): Procedure of ariel photography:

following are the main steps of Aerial photography.

→ Establishing control points.
→ flight planing and photography
→ Parallex and measurment of paallax.
→ Construction of map and catography

➡ Establishing control points.

control points are points established on grand with known relative position. The photography captured is observed by setting the control points as boundries. These should be minimum 3 to 4 points in photography.

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Flight plairing photography:

flight plairing is actully knowing the height to be maintained while taking photo area to be covered in each photograph no of photographs no of strips and time interval b/w exposures).