

# Final term paper

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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.

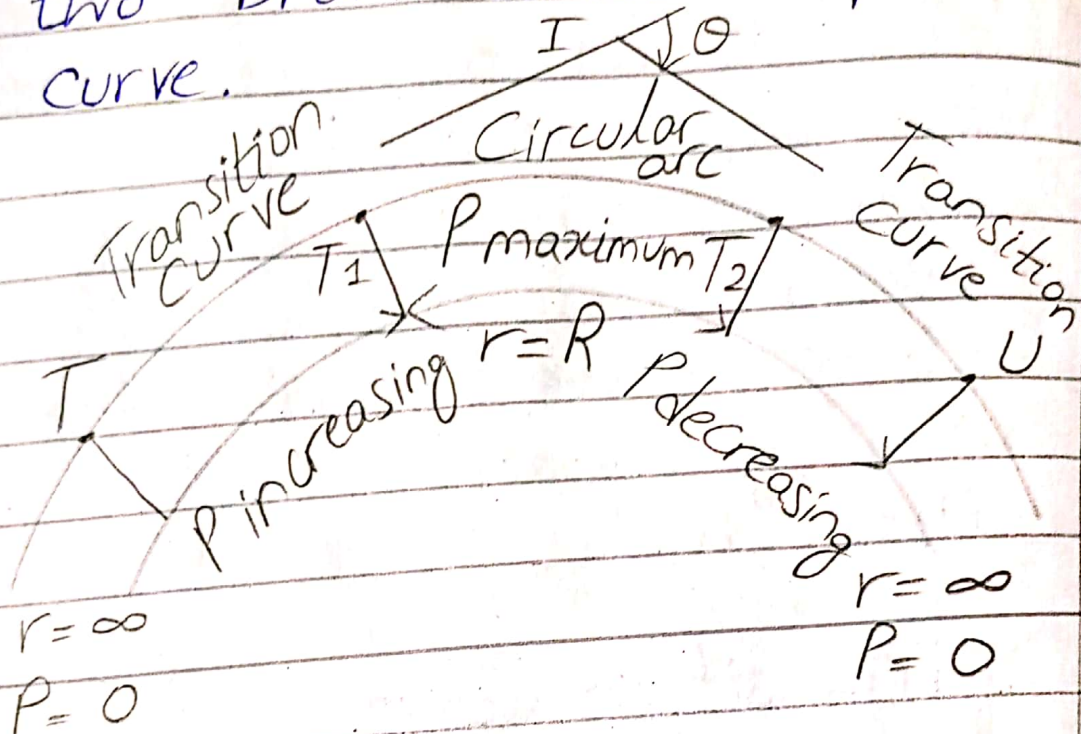
### Transition Curve:-

A curve of varying radius is called a transition curve. It is also called Spiral Curve or Easement curve.

It is used on both highway and railway between tangent and a circular curve in order to have a smooth transition from tangent to the curve and from curve to the tangent

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It is also inserted between two branches of compound curve.



Let

$W$  = weight of vehicle

$P$  = centrifugal force

$v$  = speed of vehicle, m/s

$g$  = Acceleration due to gravity

$R$  = Radius of the curve

$h$  = super elevation

$b$  = width of the road

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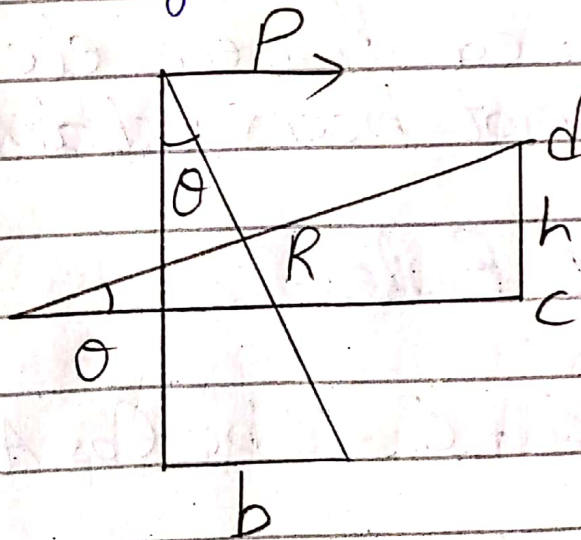
For equilibrium the resultant  $R$  of the  $P$  and  $w$  must be equal and opposite to the reaction perpendicular to the road or rail surface.

$$P = \frac{mv^2}{R}$$

$$\therefore w = mg$$

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

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



$$\tan \theta = \frac{h}{b} = \frac{dc}{ac} = \frac{P}{w}$$

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

$$h = b \tan \theta$$

$$h = b \frac{v^2}{gR} \rightarrow \text{on highway}$$

$$h = b \frac{Gv^2}{gR} \rightarrow \text{on railway}$$

Where  $G$  = distance between centre of the rail.

Super elevation is gradually applied along a transition curve. Full super elevation is attained in junction of the transition curve with the circular curve.

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## Question #02

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

Difference between triangulation and trilateration

### Triangulation:-

- 1.) All angles are measured in triangulation.
- 2.) Distance of baselines are measured.
- 3.) Some check base lines are also measured to control scale error.

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- 4.) Inter visibility between stations is essential.
- 5.) There are more internal checks in comparison with trilateration in the same geometric figure.
- 6.) The side lengths are computed on the basis of measured angles applying sine law.

## Trilateration:-

- 1.) All sides are measured in trilateration.
- 2.) Azimuth of the initial line is measured.
- 3.) Some check angles are measured to control azimuth error.

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- 4.) For small areas it is possible to measure distance without intervisibility
- 5.) There are less internal checks in comparison with triangulation in the same geometric figure.
- 6.) The angles are computed on the basis of measured side lengths applying cosine law.

## Principles of Triangulation:-

If all the three angles and the length of one side of a triangle are known,



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then by trigonometry the lengths of the remaining sides of the triangle can be calculated.

Again, if the coordinates of any vertex of the triangle and azimuth of any side are also known, then coordinates of the remaining vertices may be computed.

## Principles of

## Trilateration:-

Trilateration is a highly accurate and precise method of establishing and expanding horizontal control.

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Method of control survey in which a network of triangles is used as in triangulation system.

All the three sides of each triangle are measured in the field with the distance measuring instruments (EDMs, tapes, other apparatus).

Horizontal angles are not measured in the field.

Vertical angles are also measured where elevations have not been established.

**Cosine Rule:-**

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$A = \cos^{-1} \left[ \frac{b^2 + c^2 - a^2}{2bc} \right]$$

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## Question # 03

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

### Hydrographic Survey:-

Hydrographic Survey or bathymetric surveying is the survey of physical features present under water. 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 water by authority concerns. It is

mainly carried by means of sensor, sounding or electronic sensor system for shallow water.

Why do we use 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.

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## Factors:-

- 1.) Survey Equipment
- 2.) Properties of a Hydrographic specifications.
- 3.) Issue to a designated unit
- 4.) Programming planning of that unit.
- 5.) assessment of the taste with in that unit
- 6.) Resource allocation
- 7.) Reconnaissance requirement
- 8.) Detailed survey planning
- 9.) Plans for compilation and checking of data.

b.) What is Sounding and purpose of Sounding. Also name the equipments used to determine Sounding?

## Sounding:-

The measurement of

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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 established by level. The object of making sounding is thus to determine the configuration of subaqueous source.

### Purpose of Sounding:-

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

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## Equipment:-

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

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## Question #4

a.) What is aerial photogrammetry and why we do it?

### Aerial Photogrammetry

Aerial photogrammetry is consists of using the imagery gathered in the air by UAVs to create computer-generated 2D and 3D models. These are topographical in nature, meaning they represent the dimensions and physical features of the area of land, and in stunning accuracy. These models can be rotated and zoomed.



## Purpose :-

These are processed in a stereo-plotter. These photos are also used in automated processing for Digital Elevation Model (DEM) creation.

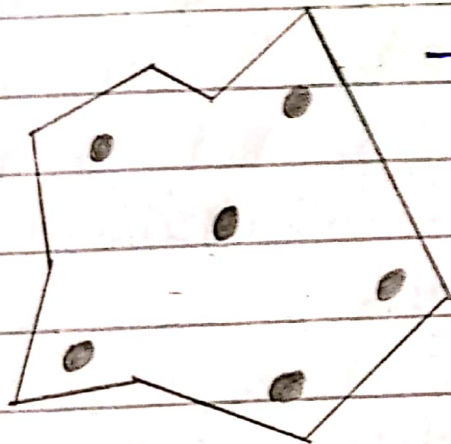
b.) Shortly explain the procedure of aerial photography.

## Procedure of Aerial Photography:-

- 1.) Establishing Control points.
- 2.) Flight planning and photography.
- 3.) Photo interpretation and stereoscopy.
- 4.) Parallax and measurement of Parallax.
- 5.) Construction of map cartography.

## Establishing Control points

There should be ~~maxi~~ minimum of 3 to 4 control points are needed in one photograph. The establishment of control points depends upon the scale of map, flight control, and cartographical method of mapping.



— Aerial  
Photography  
Area  
● Ground  
Control  
Point

## Flight Planning And Photography :-

Flight Planning is nothing but knowing the height to be maintained by flight while taking photos, area to be covered in each photograph, number of photographs,

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no of strips and time interval b/n exposures.

## Photo Interpretation and Stereoscopy:-

Photo interpretation is done by the instrument called Stereoscope which contains magnifiers.

Lens Stereoscope

Mirror Stereoscope

Scanning Mirror Stereoscope

Zoom Stereoscope

## Parallax And Measurement of Parallax:-

Parallax is nothing but a displacement of an object in the photograph when point of observation is shifted to another angle.

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## Construction of Map and Cartography:-

After collecting all photographs, its to create or plot the map with details which is done with Stereoscopic method

An Stereoscopic plotting method is called stereo plotter or multiplex is used for preparing maps.