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Section :- B

Subject :- Advanced Engineering  
Surveying.

Q:-1

Ans :-

Transition Curve:-

A curve of varying radius

is called transition curve.

It is also called spiral curve -

It is used in both highway and railway b/w tangent and circular curve in order to have smooth transition from tangent to the curve and from curve to the tangent.

It is also inserted b/w two branches of compound curve.

★  $\Rightarrow$  when vehical moves from tangent on to the curve the forces acting on it are

★ weight of the ~~vehical~~ vehicle  
★ Gravity of the vehicle.



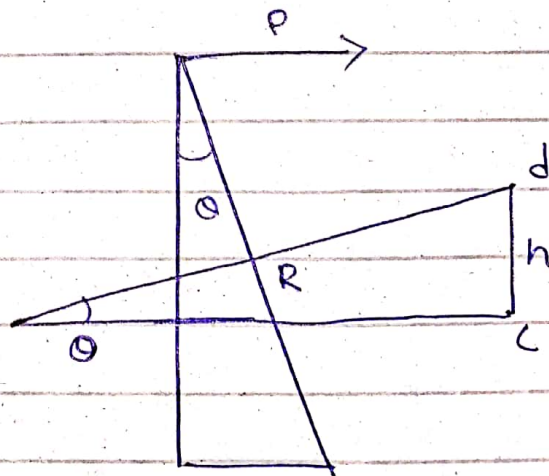
Let

$w$  = weight of vehicle  
 $P$  = centrifugal force  
 $u$  = speed of vehicle, m/s  
 $g$  = Acceleration due to gravity  
 $R$  = Radius of the curve  
 $h$  = Super elevation  
 $b$  = width of the road

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.

$$P = \frac{m u^2}{R} = \frac{w u^2}{g R} \quad w = mg$$

$$\frac{P}{w} = \frac{u^2}{g R}$$



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

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

$$h = b \tan \theta$$

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

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

where  $G$  = distance b/w center of the rail-

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

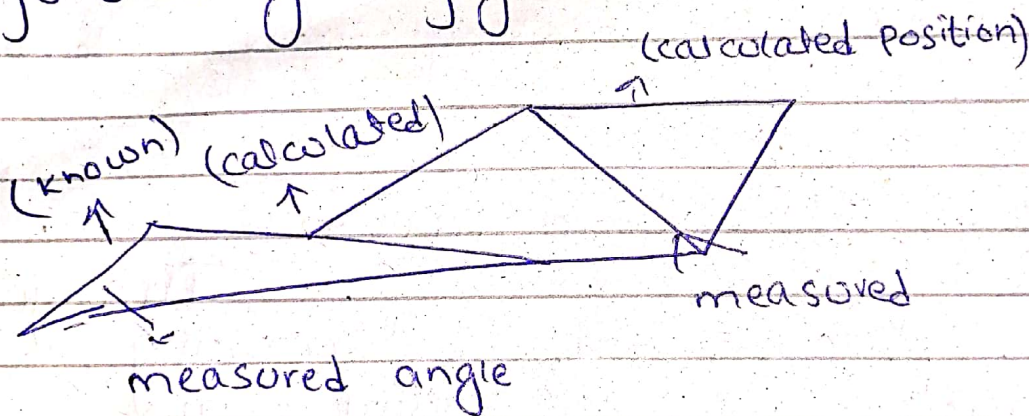


Q2:-

Ans:- Difference b/w triangulation and trilateration.

Triangulation :-

In triangulation you work with angles as illustrated in the following figure



The position of the points of the interest are computed based on measured angles and two known points - from those angles the distance are computed which are in turn used to calculate co-ordinates for the tangent points.

Trilateration :- In trilateration



you work with distances, from those distances, you compute the angles, once computed you can use them in conjunction with distances to get the position of the target points.

Triangulation :- working with angles -

Trilateration :- working with distances -

Principles of triangulation :-

Triangulation is the process of determining the location of a point by measuring angles to it from known points at either end of a fixed base line - the triangulation can also refer to the accurate surveying of a system of a very large triangulated called triangulation networks -

Principles of trilateration :- The principle

for position determination are  
trilateration triangulation and  
finger printing - a transmitted  
signal loses strength as  
distance increases - at a distance  
of one meter it is strong -  
at a distance of forty meters  
it is correspondingly weaker -



Q:- 3:-

Part (a)

Ans:-

## Hydrographic Surveying:-

\* It is the branch of surveying which deals with the water bodies e.g. lake, river etc.

\* Usual fundamental principles of surveying and leveling are adopted for acquiring data for determination

- ⇒ water volume
- ⇒ rate of flow
- ⇒ to determine the shape of the area underlying the water surface etc.

why we do it?:-

\* To determine of subaqueous excavations.

\* To measure area subjected to scouring in harbours-



\* To locate rocks and other objects such as buoys, lights etc. to aid safe navigation.

\* To prepare navigation charts exhibiting the depths available for navigation.

\* Control floods, and to plan water supply and storage from rivers.

\* To develop water sources for power, irrigation and recreation.

### Factors to determine graphic while conducting hydro-survey:-

\* The measurement of depth of water at various points is termed as sounding.

\* Depth of sounding is referred to water level at the time it is made.

\* Thereafter, the soundings are reduced to datum water level, to account for tidal waters which undergo



\* continual change of elevation with the help of gauges -

\* A number of benchmarks are established at frequent intervals along the shore lines and gauges are set on them

\* The field work consists of both horizontal as well as vertical control-

Q:- 3 Part (B)

**Sounding:-**

The process of determining depths below the water surface is called sounding.

\* Sounding is analogous to leveling on land

\* The reduce level of any point on the bottom of a water body is obtained by sounding from the mean sea level.



# Purpose of sounding:-

- \* preparation of accurate charts for navigation-
- \* Determination of the quantities of the material to be filled
- \* obtaining information for design of breakwaters, sea walls etc.

# Equipments for sounding:-

The essential equipments and instrument employed for taking the sounding may be grouped as

- (1) Short signals and buoys
- (2) Sounding equipment

- ① Sounding board
- ② sounding pole or rod
- ③ lead line
- ④ weddell's sounding machine
- ⑤ fathometer

(3)

## Angle measuring equipment

- ① theodolite
- ② prismatic compass
- ③ sextant



Q 4:- Part (a)

### Aerial Photogrammetry:-

Aerial photogrammetry is the branch of surveying that deals with production of maps such as topographic maps by compiling number of photographs taken in that area.

Why we use aerial photogrammetry

Uses of aerial photogrammetry

- \* Use for crops mark and parch marks
- \* Soil marks
- \* low profile monuments



Q 4:- Part (B)

\* 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 maps and cartography-