PAPER:
ADVANCED ENGINEERIG SURVEY.

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Q No 1:

Ans Of Q No 1:

TRANSITION CURVE:

Transition curve is a curve of varying radius introduce between a straight and a circular curve or between two branches of a compound curve of reverse curve.

OR

A curve of constantly changing radius used to connect a circular arc to a straight line or to an arc of different curvature.

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TYPES:

There are three types of transition curve.

1) Cubic Parabola
2) Spiral
3) Lemniscate

SUPER ELEVATION:

It is the amount by which the outer edge of the curve on the road or railway is banked above the inner edge.

When a vehicle passes to a curved path The following forces acts on it.

→ Weight of vehicle

→ Centrifugal force both acting through centre of

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of gravity.

The effect of centrifugal force is to push vehicle of the track. Now due to this the plane of the road surface is made perpendicular to the resultant of centrifugal force and weight of vehicle.

In other words the the outer bank of the road is raised from the inner side.

The raising of outer bank over the inner one is known as super elevation.

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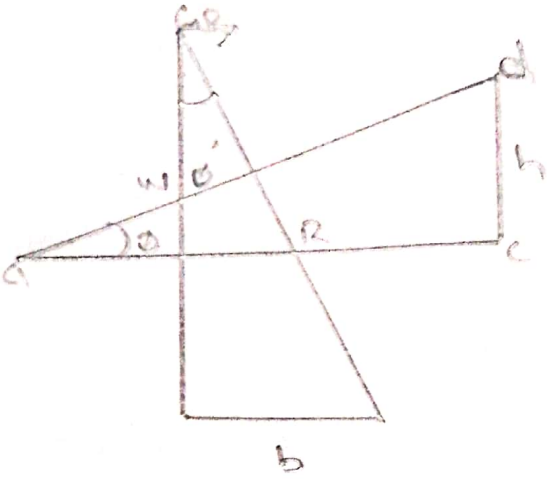
4 (b)

MATHEMATICALLY:



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 between centre of radius.

→ For equilibrium the resultant

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of the weight and centrifugal force must be equal and opposite to the road.

As we know that.

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

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

we have.

$$\text{Tan } \theta = \frac{d_c}{a_c} = \frac{P}{W} = \frac{bv^2}{gR}$$

ON ROADS:

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

$$h = b\frac{v^2}{gR}$$

ON RAILWAYS:

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

$$h = b\frac{Gv^2}{g_b}$$

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RADIUS:

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

$$R = \frac{v^2}{b \tan\theta g}$$ FOR ROADS.

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

$$R = \frac{Gv^2}{b \tan\theta}$$ FOR RAILWAYS

SPEED OF VEHICLE:

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

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

$$v = \sqrt{b \tan\theta \, gR}$$ FOR ROADS.

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

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

Taking $\sqrt{}$

$$V = \sqrt{\frac{b \tan\theta \; gR}{G}}$$

FOR RAILWAYS.

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Q NO 2:

Ans OF Q NO 2:

DIFFERENCE BETWEEN TRIANGULATION AND TRILATERATION:

TRIANGULATION	TRILATERATION
1) Working with angles.	1) Working with distances.
2) Triangulation consist of number of interconnected triangles in which the length of only one base line and th angles of the triangles are measured very Precisely. which are used to calculate the coordinates of vertices.	2) It is the Method in which the lengths of all sides of a triangle, Polygon etc are measured with an electronic instrument.

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3] The position of the point 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 coordinates for the target points.

4] This technique is mostly prefered by surveyors.

5] It is mostly used in hilly areas.

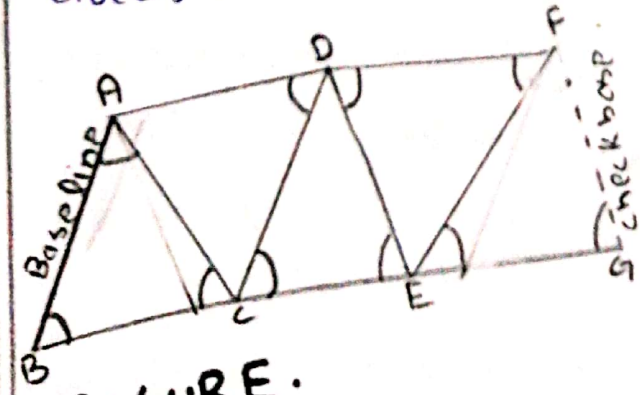
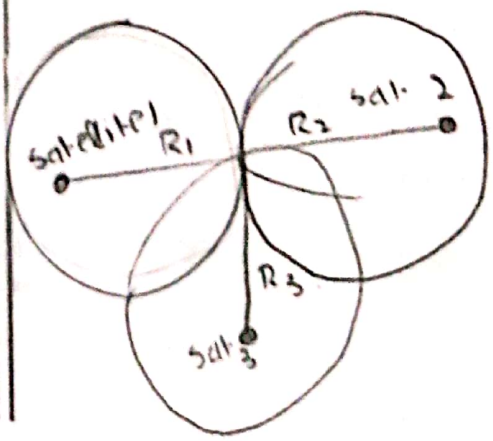


FIGURE.

3] In trilateration you work with distances. From those distances you compute the angles. once the angles is computed. you can use them in conjunction with the distance to get the position of the target Point.

4] It is the most popular technique also used by G.P.S

FIGURE



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6, Intervisibaly between stations is essential	6, For small areas it is possible to measure distances without intervisibility.
7, There are more internal checks in comparison with trilateration in the same geometric figure.	7, There are less internal checks in comparison with triangulation with the same geometric figure.

PRICIPLES OF TRIANGULATION AND TRILATERATION:

PRINCIPLES OF TRIANGULATION

→ If all three angles and the length of one side of the triangle are known than by trigonometry the lengths of the remaining sides of the triangles can be calculated.

→ Again if the coordinates.

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

SINE RULE:

$$\frac{a}{\sin(A)} = \frac{b}{\sin(B)} = \frac{c}{\sin(C)}$$

PRINCIPLES OF TRILATERATION:

- It is highly accurate and Precise method.
- All the three sides of each triangle are measured in the field with the distance measuring instruments.
- Horizantal angles are not measured in the field.
- Angle in a trilateration system are computed indirectly from the lengths of the sides of triangle by cosine formula.

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→ Vertical angles are also measured where elevation has not been established.

COSINE RULE:

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

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

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

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

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Q No3 PART A:

Ans OF Q No3 PART A:

HYDROGRAPHIC SURVEYING:

→ **HYDROGRAPHY:**

Branch of science that deals with the measurment of bodies of water.

→ **HYDROGRAPHIC SURVEYING:**

It is the branch of surveying which deals with water bodies.

EXAMPLES:

- LAKE
- RIVER
- WATER.

→ The usual fundamental Principles of surveying and leveling are adopted for acquiring data for determination of.

- Water volume.

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- Rate of flow.
- To determine the shape of the area underlying the water surface etc.

WHY DO WE DO IT:

The hydrographic survey is done because.

→ To determine the quantities of subaqueous excavation.

→ Measure areas subjected to silting in docks.

→ Locate rocks and other objects such as buoys, lights etc to aid safe navigation.

→ To Prepare navigation charts exhibiting the depts available for navigation.

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- Control floods, and to plan water supply and storage from rivers.
- To develop water resources for power, irigation and recreation.

FACTORS TO BE DETERMINED WHILE DOING HYDROGRAPHIC SURVEY:

- The measurment of depth of water at various points is termed as sounding.
- Depth of the sounding is refered to the water level at the time it is made.
- A number of bench marks are established at frequent intervals along the shoreline.

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and gauge are set on them.

- The field work consist of both horizantal and vertical Points.
- The horizantal control is established by triangulation.
- For vertical control the tide gauges are kept in the operation continuously since the water level at the gauge must also be known when sounding are recorded.
- Issue to designated unit
- Rsource allocation
- Detailed survey planing
- Programe Planning of the unit.

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Q No 3 Part B

Ans Of Q No 3 Part B

SOUNDING:

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

→ Sounding is analougue to traveling on land.

→ The reduced level of any Point on the bottom of a water body is obtaind by subtracting the sound from the mean sea level.

→ Sounding Points should be selected Keeping in mind all the important irregularities in the submarine face.

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RANGE:

It is the line along which sounding are made. They are usually fixed perpendicular to the shore line and are parallel to each other.

SHORE SIGNAL:

Each range line is marked with two signals at some distance apart along it on each shore. These signals are usually wooden tripods with a white and colored flag on the top.

- The spacing between the soundingline and between the sounding points depend upon the nature of the submarine surface as well as on the object of the survey.

- Usually spacing between.

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sounding lines is kept 30m and spacing between sounding points is kept 7.5m to 15m.

PURPOSE OF SOUNDING:

- Preperation of accurate charts for navigation.
- Determination of the quantities of the material to be filled.
- Obtaining information for design of break waters, sea walls etc.

EQUIPMENTS USED:

The equipments used to determine sounding are as follow:

- Boat.

  Sounding apparatus.
  - Sounding rod.

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(20)

- lead line
- echo sounding machine.

→ Instrument for locating sounding.

- Sounding sextant.

→

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Q No 4 PART A

Ans of Q no 4 Part A

ARIEL PHOTOGRAMMETRY:

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

- In ariel Photogrammetry an aircraft with camera setup is used to take Photographs from the air flying over the ground. while on the other hand terrestrial Photo-grammetry Photographs are taken

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from the fixed points on ground.

→ Platform for aerial photogrammetry include fixed wings aircraft, unmanned aerial vehicles. Pigeons, kites etc.

→ Aerial Photography should not be confused with air to air photography. where one or more aircrafts are used.

→ It is the technique of photographing the earth surface.

→ Some time land surveying is difficult. This difficulty is resolved by using UAVs.

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- This can also be used in the areas where disaster is happened.

WHY DO WE DO IT:

- Arial Photogrammetry is done because in many cases it is difficult for us to cover the whole area. Like. in.

- IN INDUSTRY:

People often employ drones and other UAVs To capture Photography from the air compared to the other techniques it can be more efficient to the larger areas and it would of impossible for them to attempt it directly.

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LAND SURVEYING:

As mentioned some time it is difficult to survey large area of land on foot. This is where UAVs come in. The make the entire process of surveying land more efficient and affordable. UAVs can fly either several hundred feet.

DISASTER RELIEF:

Just as UAVs make it more safer and convenient for surveyors to do their jobs. so too can they assist emergency responders in Providing Disaster relief.

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Q No 4 Part B

Ans of Qno4 Part B

PROCEDURE OF ARIEL PHOTOGRAPHY:

- Establishing Control Points.
- Flight Planning and Photography.
- Photo interpretion and stereoscopy.
- Parallax and measurement of Parallax.
- Construction of Map and Cartography.

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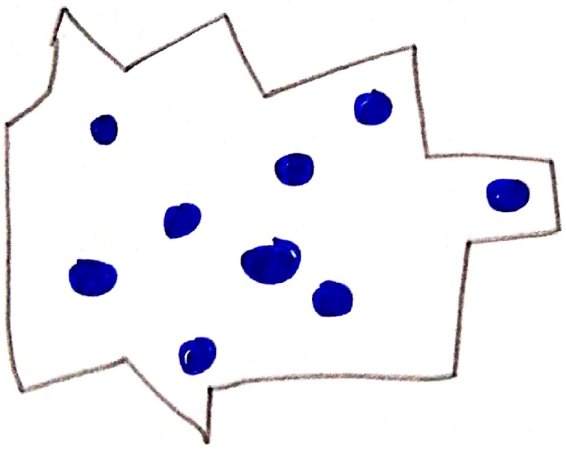
ESTABLISHING CONTROL POINTS:

Control Points are Points established on ground with known relative Position. The Points should be established in such a way that they should be easily identifiable on Photograph.



● Ground control Point.

— Aerial Photography area.

There should be minimum 3 to 4 control Points.

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FLIGHT PLANNING AND PHOTOGRAPHY:

Flight Planning is nothing but knowing the height to be maintained by flight while taking Photos.

ALTITUDE OF AIRCRAFT:

It can be computed from

Flying height H = contour interval x C

where C varies from 500 - 1500.

AREA COVERED BY ONE PHOTOGRAPH:

Area covered by one Photograph =

(length x scale) x (width x scale)

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NUMBER OF PHOTO GRAH REQUIRED:

Graph number of photo-
required to cover all
given area = $N_1 \times N_2$.

PHOTO INTERPRETATION: AND STEROSCOPY:

Photo interpretation is done by instrument called stereoscope. which contain megnifieds, so one can observe the three dimensional model. of area through it.

For accuracy control station elevation, length of lines should be sufficently available.

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PARALLAX AND MEASURMENT OF PARALLAX:

Parallax is nothing but a displacement of an object in a Photo graph when points of observation is shifted to another angle.

CONSTRUCTION OF MAP AND CARATROGRAPHY:

In this method the instrument will help to view the overlaped area in the in the spatial model. Then the model is measured and orthagraphically Projected in map.

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