

18th Nov



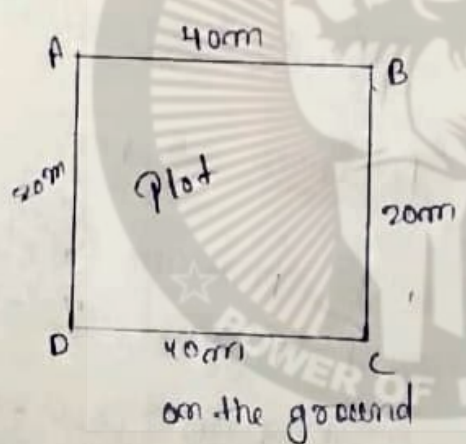
Chapter - 01 (Introduction)

① Survey $\rightarrow$ It is the art of position of various determining the relative position of various points on above and beneath the earth's surface by means of direct surface by or indirect measurement.

Relative Position means with respect to or with reference to



② Object or Purpose of Survey $\rightarrow$



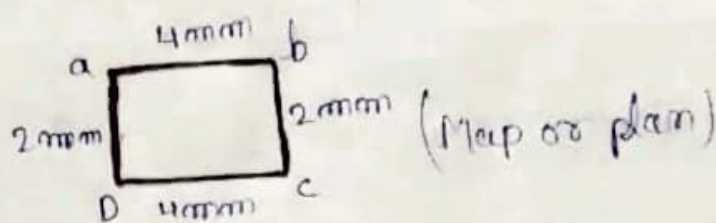
$\rightarrow$ with respect to scale

Suppose $\rightarrow$ scale
 $1\text{cm} = 100\text{m}$
 $\downarrow \quad \quad \downarrow$
Map distance $\quad$ Ground distance
or $\quad \quad \quad$ or
drawing dist. $\quad$ field distance

Representative fraction (RF) = $\frac{\text{map distance or drawing length}}{\text{G.D or field distance}}$
 $= \frac{1\text{cm}}{100\text{m}} = \frac{1\text{cm}}{10 \times 100} = \frac{1}{1000}$

Plane Scale

Least count = 1mm or 0.1cm
 $0.1\text{cm} > 0.02\text{cm}$



Suppose $\Rightarrow 1\text{cm} = 1\text{m}$
 scale

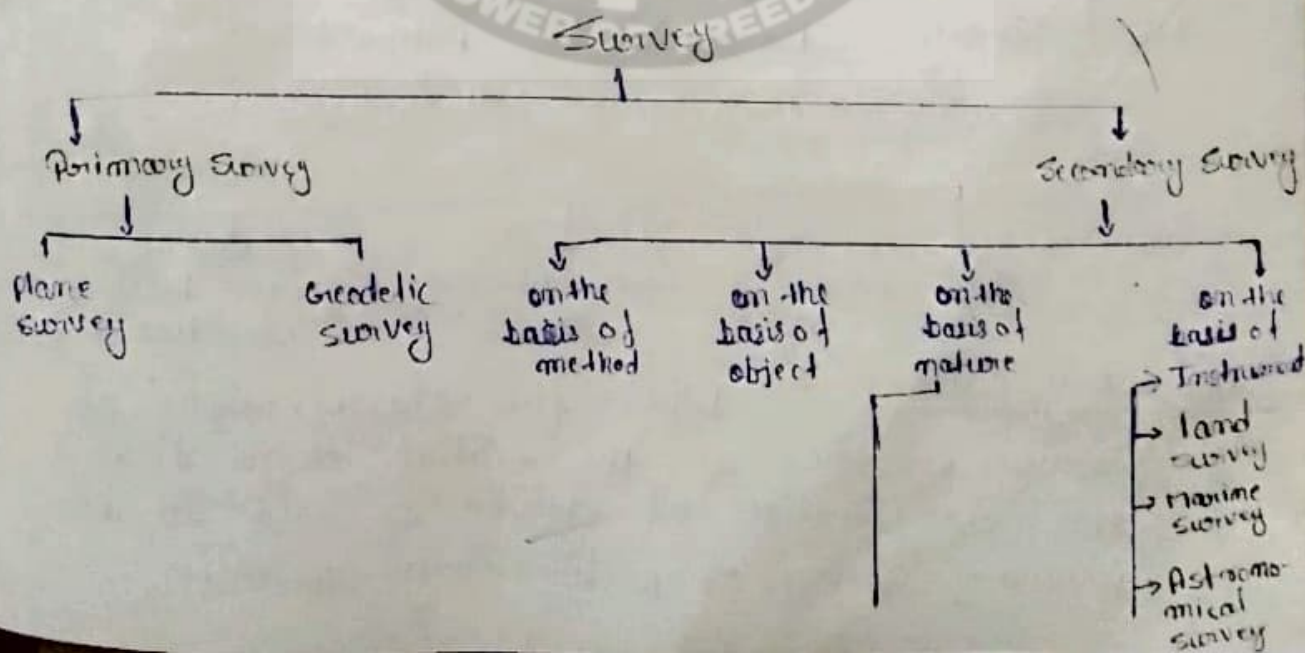
$$RF = \frac{1\text{cm}}{1\text{m}} = \frac{1\text{cm}}{100\text{cm}} = \frac{1}{100}$$

* The main objective or purpose of survey is to prepare map or plan of an existing area or region etc by means of a suitable scale.

QUT Define survey and explain the objective or purpose of survey. (8 marks)

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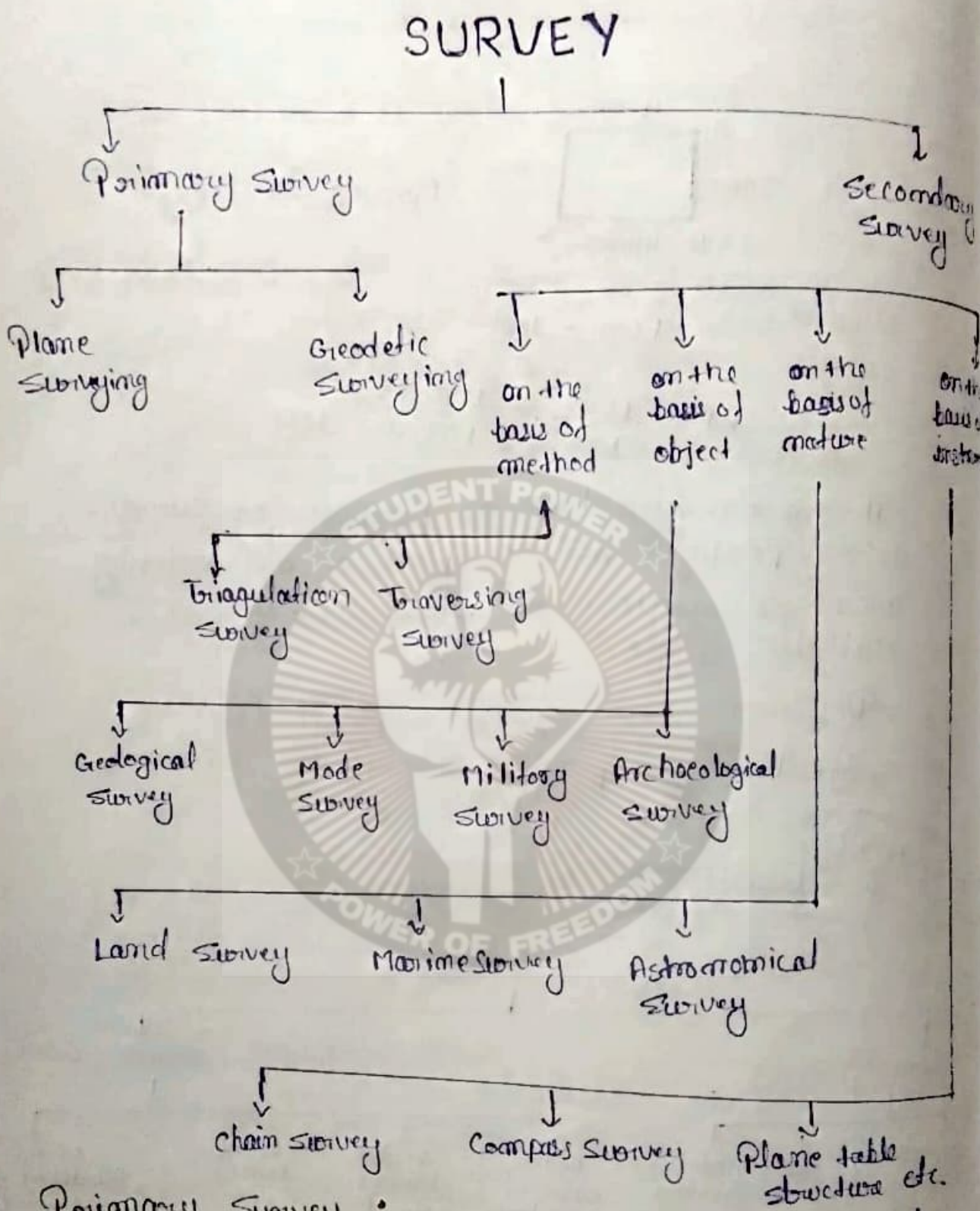
Q classification of survey $\rightarrow$



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Classification of Survey :-



Primary Survey :- When the classification of survey is done at the initial stage then this classification of survey is said to be primary survey or preliminary survey.

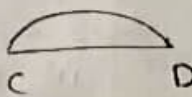
- Primary Survey is further divided into two parts $\div$

- (i) Plane Survey
- (ii) Geodetic Survey

$\rightarrow$ Shape of earth is "Geoid"

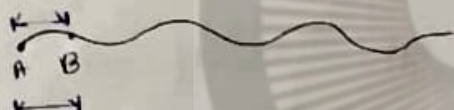
If the distance is small

 $AB = \overline{AB}$

If the distance is very large

 $CD \neq \overline{CD}$

As we know that, our earth surface is not perfectly plane

Small Area


 $AB = \overline{AB}$

Plane Survey

very large scale


 $CD \neq \overline{CD}$

Geodetic Survey

Curvature of $\Rightarrow$ Not considered
 earth

Curvature of earth $\Rightarrow$ Considered

Plane Survey $\div$ It is the type of Primary survey in which curvature of earth is not considered known as "Plane Survey"

Geodetic Survey $\div$ It is the type of Primary survey in which curvature of earth is considered known as "Geodetic Survey".



④ Differentiate between the plane survey and the Geodetic survey:-

Plane Survey

- (i) Curvature of earth is not considered
- (ii) It is suitable for small area (i.e. less than 250 km^2)
- (iii) Result is less accurate in plane survey.
- (iv) Plane survey is conducted by state agencies like the Irrigation, Department, Railway department etc.

Geodetic Survey

- (i) Curvature of earth is considered.
- (ii) It is suitable for large area (i.e. more than 250 km^2)
- (iii) Result is more accurate in Geodetic Survey.
- (iv) Geodetic Survey is conducted by the Survey of India department.

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Secondary Survey :- If the classification of survey is done except the primary survey; then the classification of survey is said to be "secondary survey".

(i) On the basis of method:-

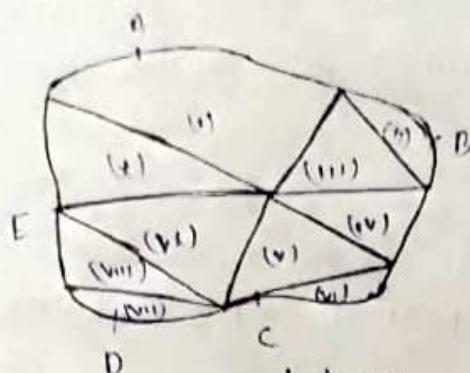
- (i) Triangulation Survey
- (ii) Traversing Survey

(i) Triangulation Survey:-



(1) Triangulation Survey →

Let ABCDEA is a given field.



Triangles

Area

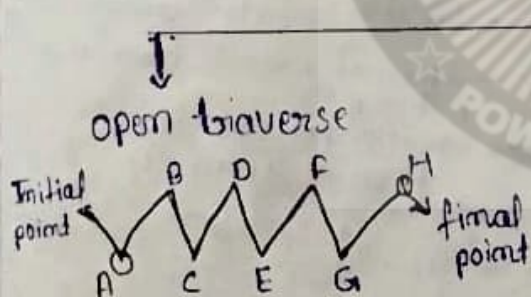
$\Delta(i)$	→	a_1
$\Delta(ii)$	→	a_2
$\Delta(iii)$	→	a_3
$\Delta(iv)$	→	a_4
$\Delta(v)$	→	a_5
$\Delta(vi)$	→	a_6
$\Delta(vii)$	→	a_7
$\Delta(viii)$	→	a_8
$\Delta(ix)$	→	a_9
$\Delta(x)$	→	a_{10}

area of ABCDEA

↳ In triangulation method; the given region is divided into number of triangles and each triangle possess (error) contain area and finally we have to add the area of the area of these triangles which gives the entire of the given region.

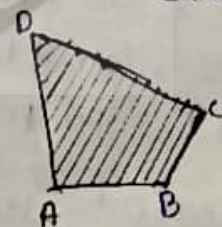
(2) Traversing Survey →

Traverse → Network or framework of line segments.



ABCDEFGH → open traverse

If the initial point does not meet or coincides with the final point; then the traverse is said to be open traverse.

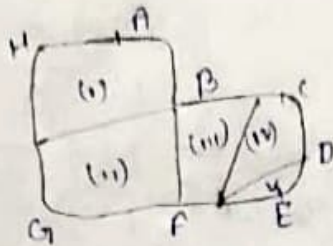


ABCD → closed traverse

If the initial point meets or coincides with the final point, then the traverse is said to be closed traverse.



In traversing method; the given region is divided into the number of traverse and each traverse possess certain area and finally we have to add



Region $\rightarrow$ ABCDEFGH

Traverse

Area

Traverse (i)	$\rightarrow$	a_1
Traverse (ii)	$\rightarrow$	a_2
Traverse (iii)	$\rightarrow$	a_3
Traverse (iv)	$\rightarrow$	a_4
Traverse (v)	$\rightarrow$	a_5

area of ABCDEFGH

② On this basis of object or purpose $\rightarrow$

- (i) Geological Survey $\rightarrow$ Related to important resources
- (ii) Mine Survey $\rightarrow$ Extraction of material from their respective place
- (iii) Military Survey $\rightarrow$ strategy point of view (सुरक्षा के लिए)
- (iv) Archaeological Survey
Ancient relics (प्राचीन शेष)

(i) Geological Survey $\rightarrow$ A type of survey basically perform to find the location of important resources and minerals that are present on or beneath the earth surface.

(ii) Mine Survey $\rightarrow$ A type of survey basically perform to find the location of mines (खाने) present on the earth surface.

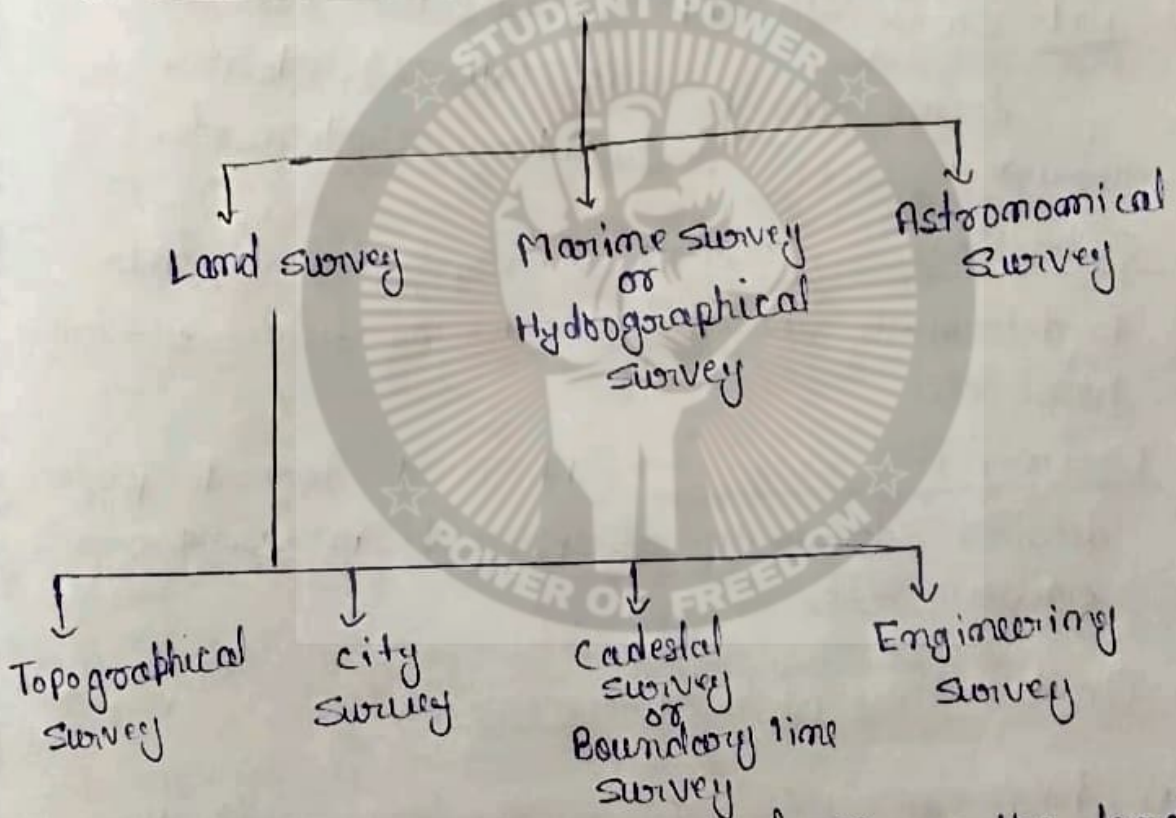


For eg $\rightarrow$ Mines of Coal, Mines of diamond, Mines of stones etc.

(iii) Military Survey $\rightarrow$ A type of survey basically perform for the strategy point of view; known as "Military Survey".

(iv) Archaeological Survey $\rightarrow$ A type of survey basically perform to know about the ancient relics (प्राचीन अवशेष), known as Archaeological Survey.

④ On the basis of nature of field $\rightarrow$



④ Land Survey $\div$ Survey perform on the land known as "land survey"

④ Marine Survey $\div$ Survey perform on the water bodies such as river, ocean, sea, lakes etc. known as Marine Survey.

① Astronomical (astrofizis) Survey :-



Survey basically perform in this space to know about the heavenly bodies such as sun, stars, planet, satellite, Galaxy, constellation, comet, Asteroids, Meteoroids etc; known as Astronomical Survey.

(i) Topographical Survey :- It is to done to determine the natural feature such as hilly mountain, plain, plateaus etc of a country known as "topographical survey".

(ii) City Survey :- It is carried out to locate the premises (ufstr), streets, water supply, sanitary system etc.

(iii) Cadestral Survey :- It is conducted in order to determine the boundaries of fields, estate (vutle) house etc.

(iv) Engineering Survey :- It is to done to prepare detailed drawing of project involving roads, railways etc.

② On the basis of instrument :-

(i) Chain Survey :- Survey perform with the help of chain known as chain survey.

(ii) Compass survey :- Survey perform with the help of compass, known as compass survey.

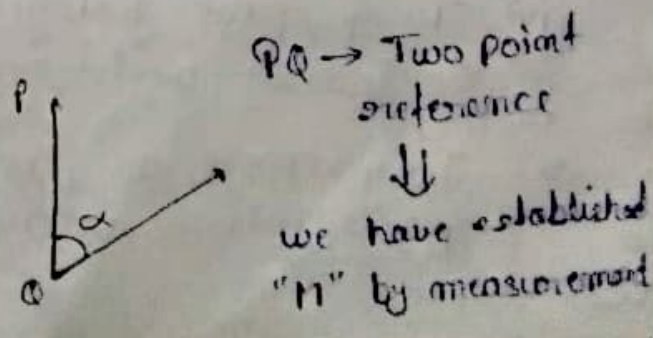
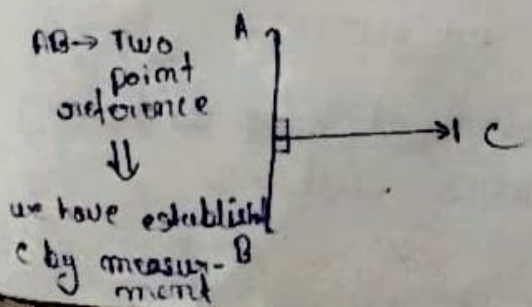


- (iii) Plane table survey $\rightarrow$ Survey perform with the help of plane table known as plane table survey.
- (iv) Theodolite survey $\rightarrow$ Survey perform with the help of theodolite known as theodolite survey.
- (v) Tacheometry survey $\rightarrow$ Survey perform with the help of tacheometry, known as tacheometry survey.
- (vi) Aerial and photogrammetry $\rightarrow$ A type of instrumental survey in which high resolution camera are mounted on the aircraft or satellite to capture the images by flying in the air and to collect the data.
- (vii) Total station $\rightarrow$ Survey perform with the help of total station known as total station survey.

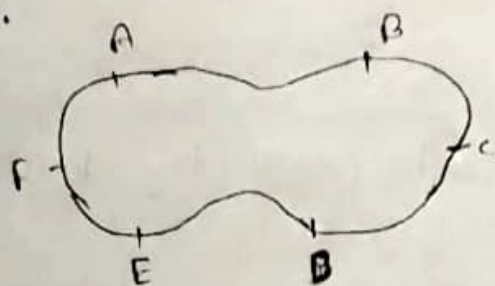
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(H) Principle of survey $\rightarrow$

- (i) Location of a point by measurement from two point of reference $\rightarrow$



② Working from whole to part $\rightarrow$ when the given region is provided for the purpose of survey then first of all, we have to establish the outer boundary of the given region, then after we have to come into the interior detail of the given region.



③ Uses of Surveying or Application of Survey $\rightarrow$

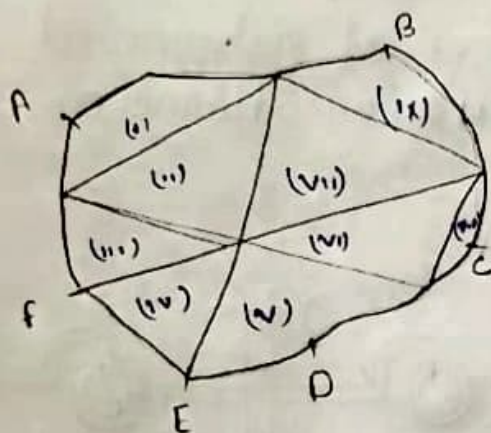
- (i) To prepare a topographical map which shows the hills, valleys, rivers, village towns, forest etc. of a country.
- (ii) To prepare a cadastral map which showing the boundaries of fields, houses and other properties.
- (iii) To prepare an engineering map which showing the details of engineering works such as road, railways, reservoir, irrigation canal etc.
- (iv) To prepare geological map showing areas including underground resources.
- (v) To prepare an archaeological map including places where ancient relics exist.

UNIT-02 - (CHAIN SURVEY)

① Definition of chain survey $\rightarrow$ If the survey is performed with the help of chain then the survey is said to be "chain survey".

② Principle of chain survey:-

The principle of chain survey is "TRIANGULATION".



<u>Triangles</u>	<u>Areas</u>
ΔI	$\rightarrow a_1$
ΔII	$\rightarrow a_2$
ΔIII	$\rightarrow a_3$
ΔIV	$\rightarrow a_4$
ΔV	$\rightarrow a_5$
ΔVI	$\rightarrow a_6$
ΔVII	$\rightarrow a_7$
$\Delta VIII$	$\rightarrow a_8$
ΔIX	$\rightarrow a_9$

area of
ABCDEFA

Meaning of triangulation $\rightarrow$ In this method

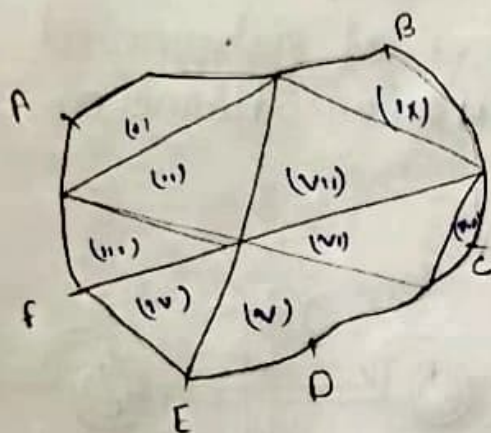
we have to divide the region into number of triangles, and try to find the areas of each individual triangle by the help of geometrical formula and at last we have to sum the areas of individual triangles which finally gives the area of required given region.

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ΔVI	$\rightarrow a_6$
ΔVII	$\rightarrow a_7$
$\Delta VIII$	$\rightarrow a_8$
ΔIX	$\rightarrow a_9$

area of
ABCDEFA

Meaning of triangulation $\rightarrow$ In this method

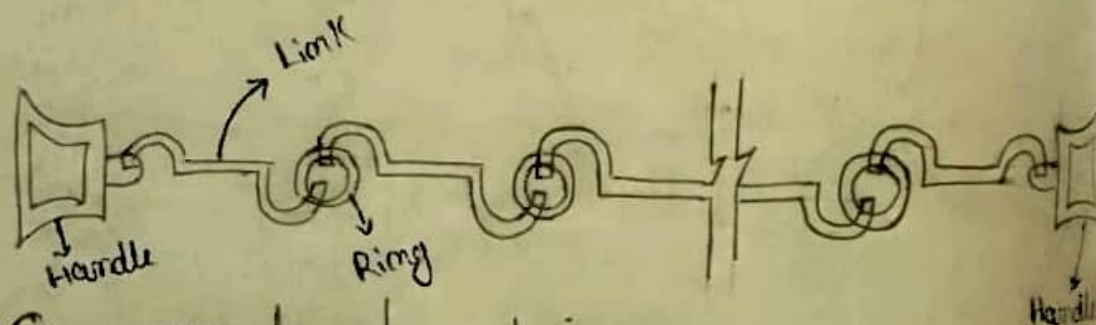
we have to divide the region into number of triangles, and try to find the areas of each individual triangle by the help of geometrical formula and at last we have to sum the areas of individual triangles which finally gives the area of requires given region.

④ Accessories of chain survey →

- (i) chain
- (ii) Tapes
- (iii) Arrows
- (iv) Wooden peg
- (v) Wooden Hammer
- (vi) Ranging rod
- (vii) Cross staff
- (viii) optical square

2nd Def

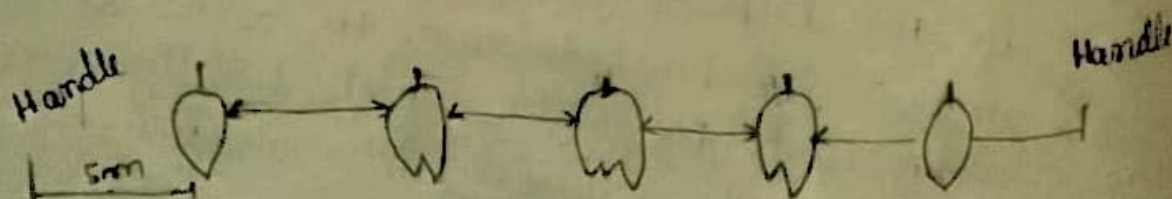
chain → A chain is prepared with 100 or 150 pieces of galvanised mild steel of 4mm diameter.

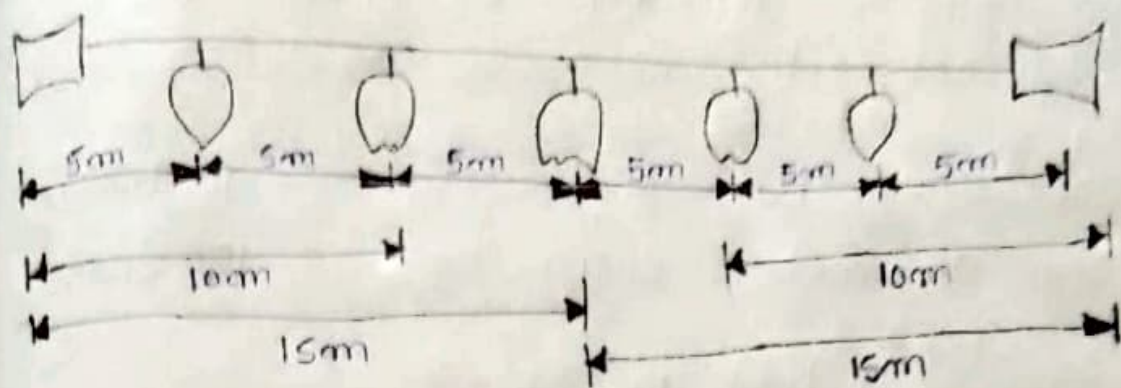


Components of a chain →

- (i) Handle
- (ii) Ring
- (iii) Link
- (iv) Tally

Tallies →





(i) Handle $\div$ It is made up of brass alloy. It is mainly used for holding the chain. Handles are placed at both the end of chain.

NOTE $\div$ Brass mixture $\rightarrow$ $Cu + Zn$

(ii) Ring $\div$ The circular part of the chain, is known as "Ring".

(iii) Link $\div$ The centre to centre distance between two consecutive rings or the distance between the centre of one ring to the external end of the handle; is known as "link".

(iv) Tallies $\div$ The main function of tallies are used for easy counting of distance in chain.

⊕ Types of chain $\div$

- (i) Metric chain
- (ii) Revenue chain
- (iii) Gunter's chain
- (iv) Engineering chain

(i) Metric chain $\div$ This types of chain are available either in 20m or 30m.

$\rightarrow$ 20m of metric chain contains 100 links

$\rightarrow$ 30m of metric chain contains 150 links

Size of 1 link in 20m $\rightarrow$

$$\therefore 100 \text{ link} = 20\text{m}$$

$$\therefore 1 \text{ link} = \frac{20}{100}$$

$$\boxed{1 \text{ link} = 0.1\text{m}}$$

Size of 1 link in 30m chain $\rightarrow$

$$\therefore 150 \text{ links} = 30\text{m}$$

$$\therefore 1 \text{ link} = \frac{30}{150}$$

$$\boxed{\therefore 1 \text{ link} = 0.1\text{m}}$$

NOTE $\div$ 20m metric chain $\Rightarrow$ size of link = 0.1m

30m metric chain $\Rightarrow$ size of link = 0.2m

(ii) Revenue chain $\rightarrow$ It is available in the form of 33 feet or 33' Revenue chain contains 16 links.

Size of one link $\rightarrow$

$$\therefore 16 \text{ link} = 33'$$

$$\therefore 1 \text{ link} = \left(\frac{33}{16} \right)'$$

$$\boxed{\therefore 1 \text{ link} = 2.0625'}$$

(iii) Gunter's chain $\rightarrow$ It is available in the length of 66 feet or 66' and having total number of links is equal to 100.

Size of one link $\rightarrow$

$$\therefore 100 \text{ link} = 66'$$

$$\therefore 1 \text{ link} = \frac{66}{100}'$$

$$\therefore 1 \text{ link} = 0.66$$

(iv) Engineering chain $\rightarrow$ It is available in the length of 100' or 100 feet and having total number of link is equal to 100.

Size of one link $\rightarrow$

$$\therefore 100 \text{ link} = 100$$

$$\therefore 1 \text{ link} = \frac{100}{100}$$

$$\therefore 1 \text{ link} = 1'$$

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② Tapes $\rightarrow$ following are four types of tapes $\rightarrow$

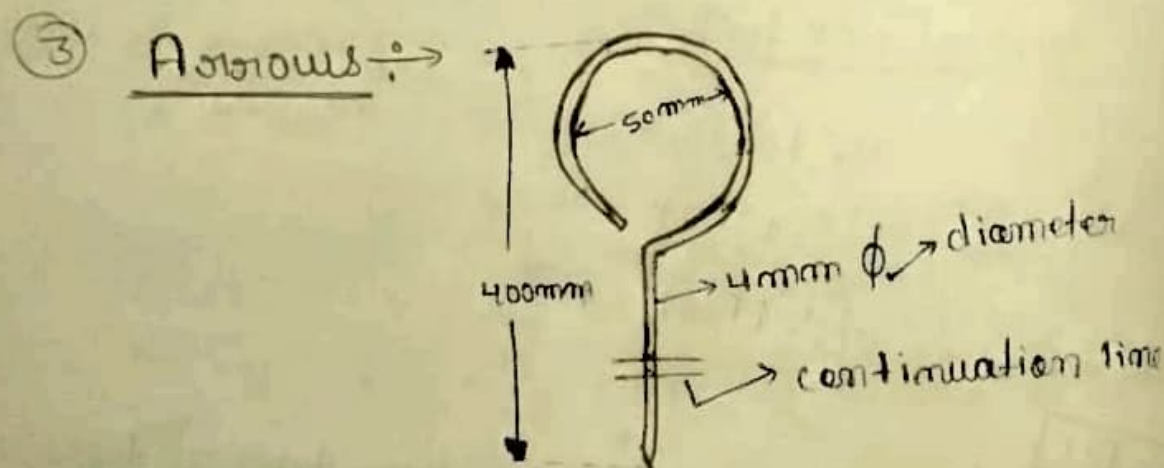
(1) cloth or linen tape $\rightarrow$

- $\rightarrow$ The main function of this tape is to resist moisture.
- $\rightarrow$ It is available in the length of 10m and 15m
- $\rightarrow$ The width of this tape is 5mm.

(ii) Metallic tape $\rightarrow$ when the linen tape is reinforced with brass or copper wire to make it durable is known as metallic tape. It is available in the length of 15m, 20m and 30m.

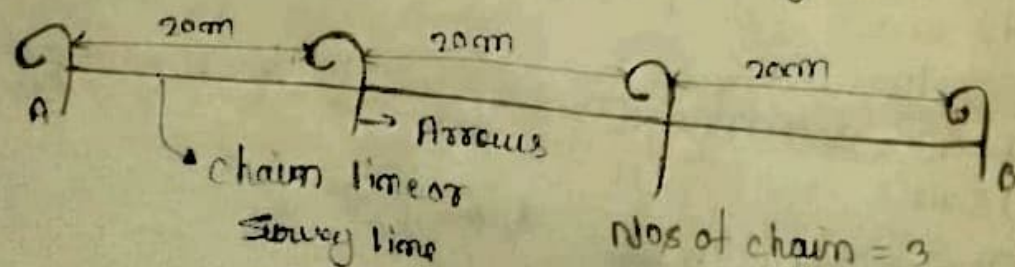
(iii) Steel tape $\rightarrow$ It is an alloy of iron and Carbon. It's width varies between 6mm to 16mm. The commonly available length 10m, 15m, 20m, 30m and 50m.

(iv) Invar tape $\rightarrow$ It is an alloy of steel (64%) and nickel (36%). It's width is 6mm. It is available in the length of 30m, 50m, and 100mm.



$\rightarrow$ Arrows are used for counting the number of chains while measuring a chain line.

Let us consider we are using metric chain.

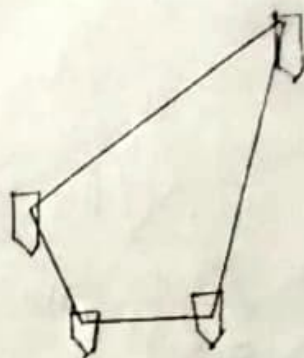


Nos of chain = 3

total distance b/w A & B = 3×20
= 60m

④ Wooden Peg $\rightarrow$

$\rightarrow$ Wooden peg are used to locate or established the survey station.



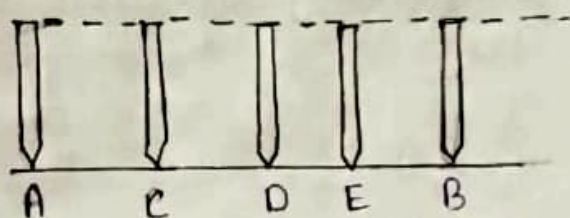
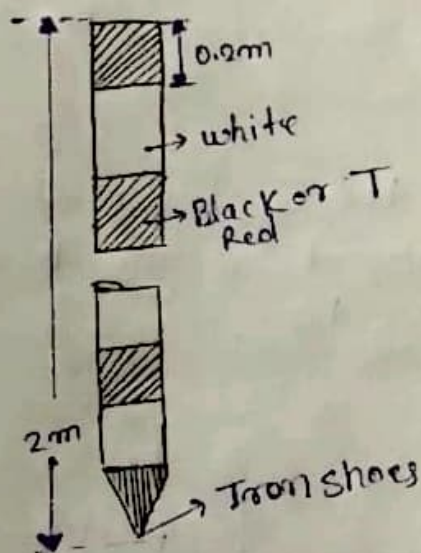
⑤ Wooden Hammer $\rightarrow$

The main function of wooden hammer is to help in penetration of wooden peg into the ground.



wooden Hammer

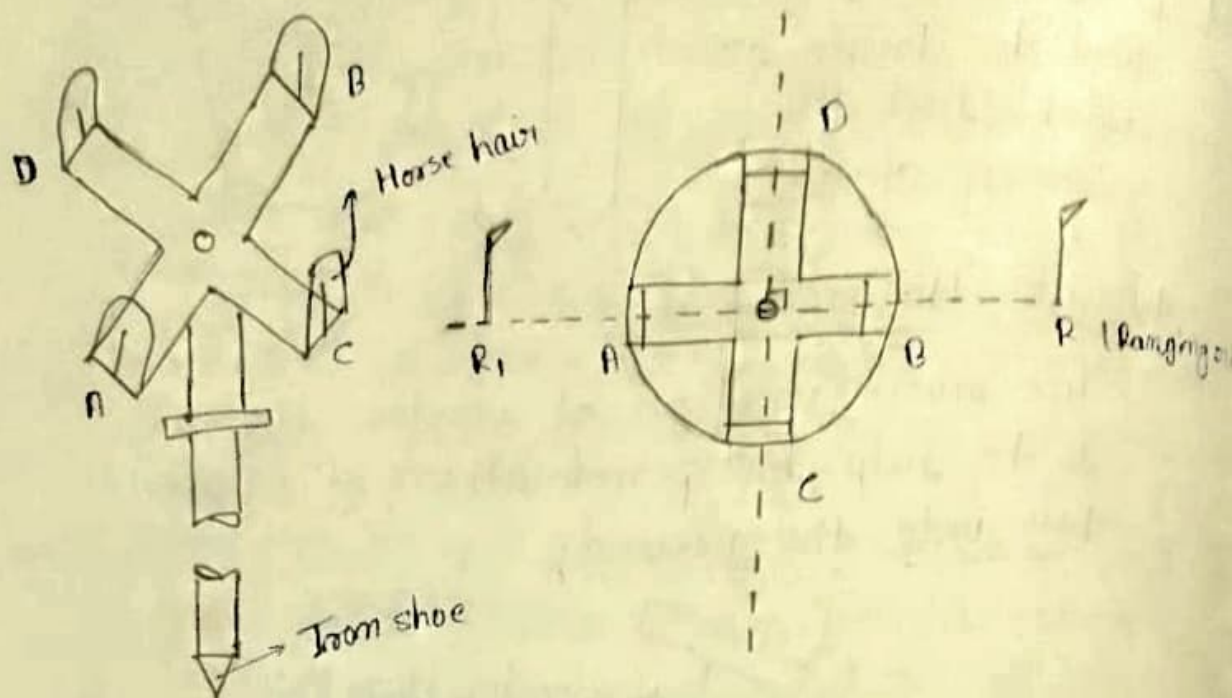
⑥ Ranging Rod $\rightarrow$



The main function of ranging rod are used in making the given chain line or survey line straight by putting it at the intermediate points between the end points of the given line.

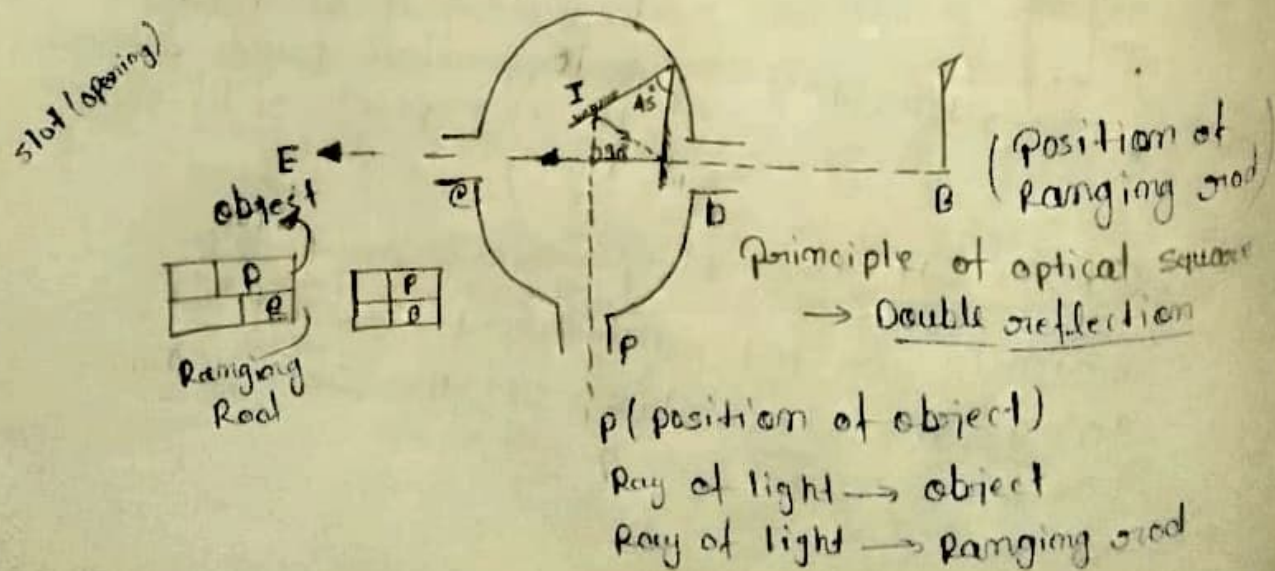
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⑦ CROSS STAFF $\rightarrow$ It is an instrument basically use for setting the object at 90° to the chain line or the survey line.



H/W write down the construction and working of cross staff (8 marks).

③ Optical square → It is the instrument also used for setting the object at 90° to the chain line or the survey line.

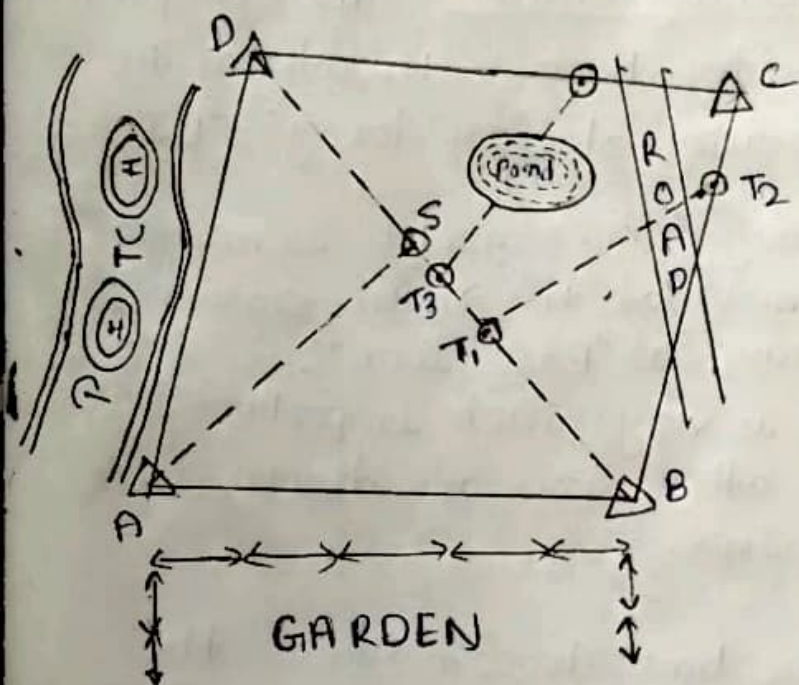


H.W write down the construction and working of optical square (9 marks)

9th Dec

① SOME IMPORTANT DEFINITIONS AND ILLUSTRATION IN CHAIN SURVEY TRAVERSE :-

Chain Survey Traverse $\rightarrow$ Chain Survey Accessories



Main survey station
for eg: A, B, C, D

Main survey line for
eg: AB, BC, CD, DA

Base line for eg: BD

Tie line or subsidiary
line for eg: T1, T2, T3, T4

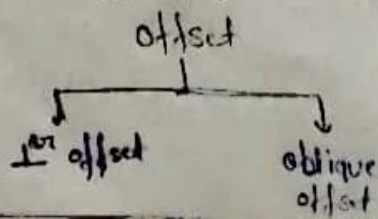
Tie station or subsidiary
station for eg: T1, T2
T3, T4

check line $\rightarrow$ for eg: AC

① Main survey station $\rightarrow$ The outer most control point of given boundary or region is known as main survey station. for eg: A, B, C, D.

- ② Main Survey line $\rightarrow$ Line joining the main survey station is known as Main Survey line. for eg $\div$ AB, BC, CD, DA.
- ③ Tie line or subsidiary line $\rightarrow$ The line which is used to locate the interior details in chain survey traverse; is known as tie line or subsidiary line. for eg $\div$ T₁, T₂, T₃, T₄.
- ④ Tie station or subsidiary station $\rightarrow$ The end point of tie line subsidiary line is known as tie station or subsidiary station for eg $\div$ T₁, T₂, T₃, T₄.
- ⑤ Base line $\rightarrow$ The longest line which is mainly passes through mid of the chain survey traverse is known as "Base" line".
for eg $\div$ BD. It is very much important line because all the other lines are drawn with respect to this line.
- ⑥ check line $\rightarrow$ The line drawn from the apex of the triangle to the opposite side of triangle; is known as check line. This check line is drawn to check the accuracy of the given triangle for eg $\div$ AS.
- ⑦ offset $\rightarrow$ The important object situated outer side mean by the main survey line is known as offset.

(object is go with respect to main survey line)



(object is other than with respect to main offset survey line)