Civil Engineering :—

A civil engineering is the specialization of engineering which deals with planing, designing, constructing, maintaining and operating infrastructures like buildings, bridges, cannals, dams, water supply and treatment system etc.

⭐⭐ Specialization of civil engineering ⇒

(i) Geotechnical engineering (Soil engineering) :—

Bearing Water Consist

Geotechnical engineering is the specialization of civil engineering. In which we deal with the study of soil, its behaviour and its applications.

→ Geo-technical engineering is also known as soil engineering or soil machanics or geo-technic. A soil engineer investigates & analyzes a site for such qualities as soil characteristics, composition, & drainage.

2) Structural engineering :—

Structural engineering is the specialization of civil engineering which is basically focused on work of structures And on desiging those structures to with stand the stress and pressures of the enviroment and Remain safe, stable and secure

3. Environmental Engineering ⇒ Environmental engineering is the branch of civil engineering concerned with the application of scientific and engineering principals for protection of human population from the effect of adverse environmental factors, protection of environment both local and global and also improved the environmental Quality.

- In engineering Cources this subject is classified into two parts

(i) Water Supply engineering
(ii) Waster water engineering.

(4.) Transportation Engineering ⇒ Transportation Engineering is can be done as the application of technology and scientific principals for planning, designing operation and maintaining facilities for any mode of transportation in order to provide movement of persons to be safe, fast, economical efficient and comfortable or convenient and importantly environment Compatible.

- Transportation engineering includes all types of

transportation mode such as highways, roadways, water ways and air ways.

⇒ Some Branches of transportation engineering are
(a) Highway engg. (b) Railway engg.
(c) Airport engg.

5.) Surveging ⇒

Surveging is the branch of civil engineering which deals with all type of measurement and the measurements generally involved in surveging are linear majorment (distance majorment), Angular majorments (locating the points on a field), levelling (Elevation all vertical distance).

6.) Construction management :—

Construction engineering is the disciplaine engineering which deal with design, planning and construction of every type of structure such as buildings, bridge, air podes, roads etc.

Construction management can be devided into following type :—
(i) Building material
(ii) Building construction
(iii) Building technology

7.) Water resource engineering ⇒ Water resource engineering deals with the collection and management of water as a Natural resource.

→ Water resource engineering having its task of suppling water for human use, removing water when human are finished using its. And developing methods of avoiding damage from excess water (flood condition).

→ Work of water resource engineering involved the planing and management of constructed facilities that address these task.

→ Hydrology (जल चक्र cycle), Irrigation (सिंचाई) eng., dam eng. comes under water resource eng.

Role of civil engineer in Society ⇒

(i) Design and Construction of building :— The main role of civil engineer consider is to design and build structure. Civil engineers are involved in creating structure for human residential purpose, office and other such activity.

From the design work to execution work a civil engineer holds the complete responsibility.

(ii) Construction of Roads ⇒ Roads are the main mode of transportation in any work of the world. Civil engineer construct road not only for the betterment of human being in comfort sense but also for the commercial sense as Roads are main means of transporting good as well.

(iii) Design and construction of bridges ⇒ Bridges are the structures which are built over water bodies or even roads in order to cross the physical obstacles. and still not closing the way. Bridges are built since edges by civil engineer. Site investigation to ~~deg~~ design and execution to operate and ~~maintainance~~ of such type of heavy structure. A civil engineer is involved in every step of work of bridge construction.

(iv) Design and construction of Dam ⇒ A dam is a ~~barrier~~ barrier (अवरोध) and obstacle to resist

flow of water of any surface underground stream in order to create reserve wires for storage of water. The stored water use for irrigation work, human consumption, generation of electricity, industrial benefits etc.

→ Geological investigation for selection of dam, design and analysis of dam, construction of dam and their operation and maintenance are done by a civil engineers.

(v) Water Supply :—

A civil engineer is responsible for converting water from river to portable water suitable for human consumption.

→ Water treatment plants are designed and built by civil engineers where raw water is treated and various physical & chemical attribute of water drop under save limit.

(vi) Waste water management :—

(Solid waste management)

The waste water is released from toilets & kitchen of household or waste water is rele from industries stand a big

challenge for a civil engineer to be disposed

→ Waste water treatments plants are created by civil engineers for treating the waste water depending on the amount of waste present in it.

→ Such water after treatment is reused for agriculture purpose.

(vii) Irrigation work :— It carries important nutrient from the soil and is cannel, dam etc. an imp. trigger for germinate

(viii) Surveging work :— linear, angular etc.

Q.1 Impact of infrastructure development on economie of country:-

Ans-

Infrastructure sector is a key driver for the indian economy. Infrastructure sector includes power, bridges, dams, roads and urban infrastructure development. In 2018, india ranked 44th out of 167 countries in world bank's logistics performance index (LPI) 2018.
Some infrastructure sectors are in Society :-

(i) Buildings :-

The buildings are made by a civil engineer. And civil engineers are involved in creating structure for human residential purpose, office & other such activity.

(ii) Roads :-

Roads are the main mode of transportation in any work of the world. Civil engineer construct road not only for the betterment of human being in comfort sense but also for the commercial sense.

(iii) Bridges :-

Bridges are the structures which are built over water bodies or even roads

in order to cross the physical obstacles and still not closing the way.

(iv) Dams :—

A dam is a barrier and obstacle to resist the flow of water of any surface. The stored water use for irrigation work, human consumption, generation of electricity, industrial benefits etc.

(v) Water supply :—

A civil engineer is responsible for converting water from river to portable water suitable for human consumption.

India, being the world's largest democracy, is the seventh largest country in terms of land ~~area~~ area with the land areas and the second most populous country in the world.

(SURVEYING)

Q-1 Define survey, its objects & principal

Ans- Surveying :—

Surveying is the branch of civil engineering which deals with all type of measure and measurements generally involved in surveying are linear measurement, angular measurement, & levelling.

Objective of Survey :—

(i) To determine the relative position of any point of object on the earth.

(ii) To determine the distance and angle b/w different objects.

(iii) To prepare a map or a plan to represent a area on a horizental plane.

(iv) To prepare contour maps.

(v) Layout using survey data, the various engineer works in connect position.

(vi) To solve measurement problem on optimal way.

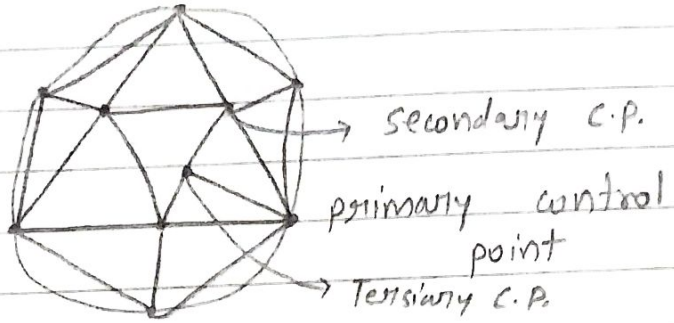
(vii) Collect and record data on the relative position of points on the earth surface.

(viii) Compute the area and volume using survey data which is required for various engineering purpose.

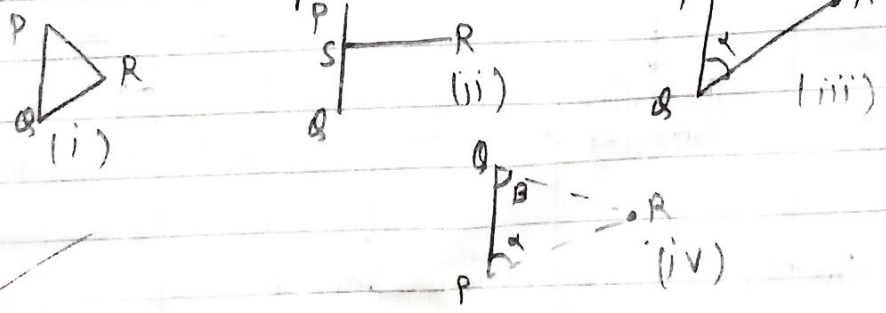
Principal of survey:—

(i) Working from whole to part :—

According to this principal it is always designable to carry out survey work from whole to part. This means when an area is to be survey, first a system of control points are to be stablished covering the whole area with very high accuracy then minor details are located by less precise or less accurated method.



(ii) Location of a point with reference to at least two points :—



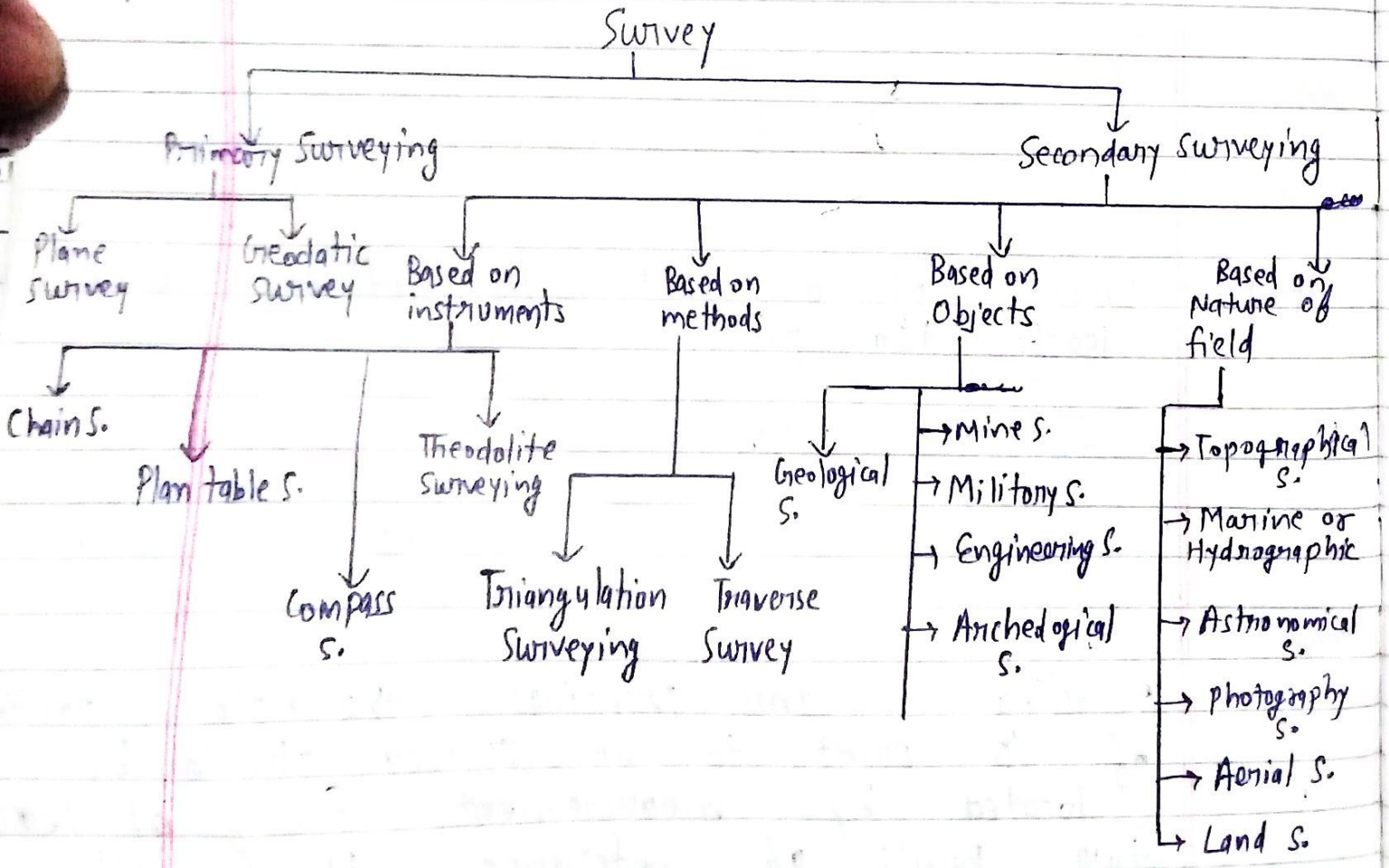
According to this principal the relative position of a point to be survey should be located by measurement from at least two points of reference, the position

points which have already been fixed. If P & Q are two reference point on the ground any other point such as R can be located by any of the direct method according to figure.

A singal method is sufficient to locate the relative position R, but it is necessary to go through the work with higher accuracy by adopting two or more method.

Q.2 Explain different type of survey.

Ans-



1] Plain Survey :—

(a) The shape of the earth is spherical hence the surface of the earth is obviously curve. But in case of plane surveying the curvature of the earth is not taken into account.

(b) The plane survey is carried out for small area.

(c) Plane surveying is done on an area less than 250 km^2.

(d) The degree of accuracy compartively is low.

2:] Geodatic Survey.

(a) In case of geodatic surveying the curvature of earth is taken into account.

(b) The plane survey is carried out for long area.

(c) Geodatic surveying is done on a area greater than 250 km^2.

(d) The degree of accuracy comparatively is high.

Secondary type :—

(i) Based on instrument ⇒

(i) Chain Surveying :- It is a simplest method of surveying in which the linear measurements are directly taken in the field.

(ii) Plan table surveying :- In plan table surveying, the field work and the

plotting is done using graphical method and it is used where high accuracy is not required.

(iii) Compass surveying :—

In this surveying, a compass is used to determine the direction of survey line and it is also used to show the position of any object or any point.

(iv) Theodolite Surveying :—

In which we can measured not only horizental angle but also verticle angle.

(ii') A Based on method :—

(i) Triangular Survey :—

In this survey, whole the area is divided into no. of triangal as the triangal consider the simplest structure for measurement.

(ii) Traverse survey :—

In traverse surveying, traverse are formed and linear & angular measurement related survey can be carried out.

(iii) Based on object :—

(i) Geological Survey
(ii) Mine Survey
(iii) Military Survey
(iv) Engineering Survey
(v) Archeological Survey

(iv) Based on nature of field :—

(A) Topographical Survey :— They are carried out determine the position of natural features of a region. Such as river, stream, mountains etc.

(B) Marine Survey :— It is carried out to determine mean sea level (MSL), depth of water bodies, cross-sectional area of flow etc.

(c) Astronomical Survey
(d) Photographic Survey
(e) Aerial Survey :— It is data about large trakes of land is collected by taking photo graphs of an aeroplane.

(f) Land Survey :—

It is the technique, profession and science of determining the terrestrial or three dimensional positions of points and the distances and angles between them.

Q.3 Explain the unit of different measurement.

Ans- Units of measurement provide standards for our comparisons, so that the numbers from our measurements refer to the same thing.

For example, the metre is a standard unit to measure length.

A unit of measurement is a definite magnitude of a quantity, defined and adopted by convention or by law, that is used as a standard for measurement of same kind of quantity. Any other quantity of that kind can be expressed as a multiple of the unit of measurement.

- Seven SI base Units

	Name	Symbol	Measure
(i)	Metre	m	length
(ii)	kilogram	kg	mass
(iii)	Second	s	time.
(iv)	Ampere	A	electric current
(v)	kelvin	K	thermodynamic temp.
(vi)	Mole	mol	amount of substance
(vii)	Candela	cd	luminous intensity

Measurement is one of the most important things in civil engineering and without measurements, we can not complete any construction.

Units for measurement:—

1 inch = 25.4 millimeters = 2.54cm
1 meter = 39.37 inches = 1.09 yards
1 liter = 0.22 galls (imp.)
1 gallon (imp.) = 4.546 liters
1 gallon (US) = 3.785 liters
1 kg = 2.2046 pounds (lb)

1 tonne = 1000 kg = 10^6 grams.
1 quintal = 100 kg = 10^5 grams.
1 slug = 14.606 kg
1 slug = 32.2 lb
1 foot = 12 inches
1 yard = 3 feet
1 furlong = 220 yards
1 mile = 8 furlong
1 kilometer = 1000 meters.
1 m = 100 cm
1 liter = 1000 ml
1 liter = 1 kg
1 kiloliter = 1 cubic meter / 1 cu.m / 1 m^3.
1 cu. ft. = 28.317 liters
1 cu. ft = 0.028 cu. meters
1 cu. ft = 6.24 galls
1 cu. ft. = 7.48 galls (US)
1 imp. gall = 1.20 galls, liquid.
1 imp. gall = 1.03 galls (US), dry.

1 acre = 43560 sq. ft
1 acre = 4046.46 sq. m

Plans and Maps ⇒

(i) The main object of the survey is to developed a plan and a map. The results of survey when plot on a paper form a plan or map.

(ii) A plan is the graphical representation to some scale, of the features on, near or below the surface of the earth. As projected on a horizontal plane. The representation is called a map. if the scale is small and it is called a plan if the scale is large.

(iii) On a plan only horizontal distances and directions are drawn but in case of

topographical map (Contour) the vertical distances can also be represented by using Contour lines.

(iv) For general purpose we say that representation of a state or a country is done by a map. And the representation of a locality or buildings are done by a plan.

Scales :— The area survey are generally very large and debict the whole area on a small piece of (चर्मपत्र) paper we need scales.

Scale of a plan or map is defined as the fixed ratio of the distance b/w two points on the sheets are their corresponding distance on the ground.

(1) Numerical Scale ⇒ Generally two type of numerical scale are used.

(i) Engineering scale
(ii) RF (representative fraction)

(i) Engineering Scale :— 1 cm on the plan is representating some whole numbers of meter on the ground. Such as 1cm = 10m etc.
This type of scale is called engineer scales.

(ii) RF ⇒ RF can be defined as ratio of map distance to the corresponding ground distance.

$$\text{R.F.} = \frac{\text{Map distance}}{\text{Ground distance}}$$

1 unit of length on the plan represents some no. of same unit.

Eg- 1cm = 10m

$$\text{R.F.} = \frac{1\text{cm}}{10\text{m}} = \frac{1}{10 \times 100} = \frac{1}{1000}$$

(2.) Graphical Scale ⇒

(i) plain scale :- A plain scale is used to measure distances in two digits (unique and tenth). For example cm & mm, m & dm etc.

(ii) Diagonal scale :- The diagonal scale can measured distances upto three digits (unit, tenth & Hundreds)
For example - (i) m, dm & cm etc.

(iii) Verniers scale :- A veriner is a divice for measuring accuratally the fractional part of the smallest divide on a graduated scale or main scale.
The readings are taken closer than the smallest reading on the graduated scale

→ The vernier consist of small scale for, called vernier scale which moves along the graduated scale, called main scale

→ The vernier scale has an index mark which represent the zero of the vernier scale.

Least count :— The least count of the vernier is equal to the difference in length of one division of the main scale and one division of the vernier scale.

Types of vernier scale :—

(i) Direct vernier ⇒

The direct vernier has divisions which are slightly shorter than those of the main scale.

Let us assume that n division on the vernier scales are equal in length to (n-1) divisions on the main scale.

(ii) Retrograde vernier ⇒

A retrograde vernier has divisions which are slightly longer than those of the main scale.

If n divisions of vernier scale are equal to (n+1) divisions on the main scale.

Linear Measurement

Topics :-

(i) Introduction (ii) Types of chain & taps
(iii) Ranging out survey line
(iv) Taking measurement of sloping ground
(v) Tap corrections (vi) Conventional symbol

(i) What is linear measurement? (direct measurement) ⇒

A chain or tap is generally used for linear measurement in surveying. For work of ordinary accuracy a chain can be used but for higher accuracy a tap is used.

(ii) Chaining :- The term chaining in Survey work is used to refer to measurement of distance with a chain and the term taping can also be used for measurements with a tap.

Method of measuring distance ⇒

(i) Direct method (ii) Indirect method

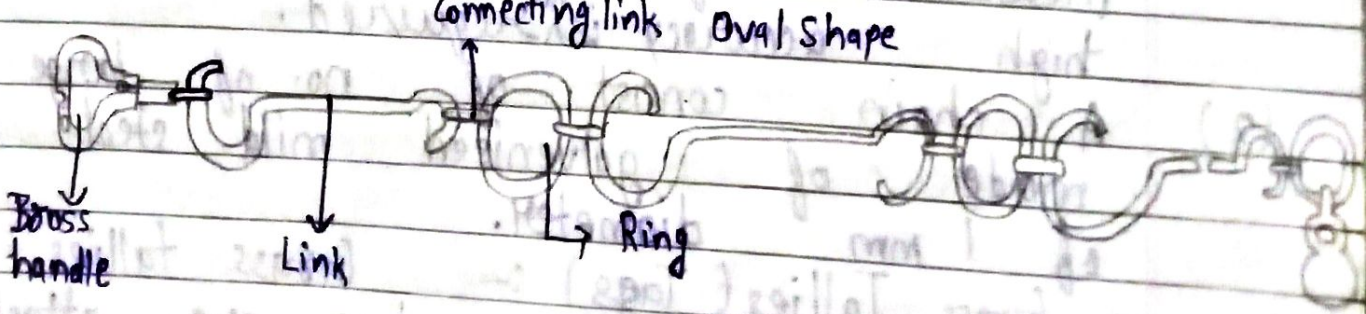
(i) Direct method :- These are the approximate measurement and it is used for basically leveled area or smooth surfaces they can give results with in 1% error.

These measurements may be taken by
(i) Chain (Chaining) (ii) Tap (Taping)
(iii) ~~Ba~~ Base (Bacing) (iv) Using fadometer
(v) Using passometer (vi) Speedometer
(vii) Odometer

(ii) Indirect measurement :- Now a days for measuring distances electronic equipment are used, known as EDM (electro magnetic distance measurement) instrument. These instruments are based on the function of electro magnetic waves. They even display the distance measure but they are costly and delicate(नाजुक). Hence, for ordinary survey work they are not used commonly (Example- EDM and TS)

* Instrument for chaining ⇒ This instrument can be classifies as chain, tap, arrows, begs, ranging rood, offset rods, plumb bob

(i) Chain :—



(I) Chains are made of straight link of galvanized mild steel wire which is bent into ring at the ends and joint each other by three small circular or oval wire rings. And this rings provide flexibility to the chain.

(II) The ends of the chain are provided with brass handle.

(III) The length of a ~~ring~~ link is the distance b/w the centres of two consicative middle rings and the length of the chain is measured from the outside of one handle to the outside of the other handle.

Types of chain

(i) Metric chain (ii) Revenue chain
(iii) Surveyor's/~~Gun~~ Gunter chain
(iv) Engineer chain

(i) Metric chain :—

(1) A metric chain is commonly used for measurement of distances when a very high accuracy is not required.

(2) A chain consist of no. of large links made of galvenised mild steel wire of 1 mm diameter.

(3) Grass Tallies (Tags) :— Grass tallies and rings are attached at some fixed interval.

1 mile = 1.6 km

(4.) For 10m long chain grass tallies are fixed at every meter of chain.

(ii) Revenue chain :—

(1) The revenue chain is 33 feet long and consist of 16 links. Each links being $2\frac{1}{16}$ ft long. is the diamension.

(2.) This chain is generally used for cadastral survey

(iii) Surveyor's / Gunter Chain :—

→ A Gunter or surveyor chain is 66ft long and consist of 100 links.

→ Each link being 0.6 ft long.

→ The 80 gunter chain is equal to 1 mile.

(iv) Engineers chain :—

Engineer chain is 100ft long and consist of 100 links

→ Each link being 1 ft long.

→ At every 10 links brass tags are fastened

Different type of tap ⇒

(i) Cloth or linen tap :—

→ 12-15 mm width cloth or linen is varnished and graduation are marked.

→ Brass handles are provided at the ends.

→ They are available in length of 10, 20, 25 & 30m

→ Light and flexible
→ Not strong
→ Affected by moisture, can string
→ Due to stretching they extend.

(ii) Metallic tap :—

They are made of varnished stream of water proove linen with small wire of brass, copper or bronze or Taps of length 10, 20, 30, 50 m
→ Red and black colour marking are used for indicating meters and its fraction in cm.
→ Light flexible and not easily broken.
→ These steps are commanly used in surveying.

(iii) Invar tap :—

→ Invar is an alloy of nikal (36%) and steel.
→ Coefficient of thermal expansion is low. hence error due to variation in temp. do not affect the measurement
→ Width of the tap 6mm.
→ Accurate but expensive.
→ Taps of length 30, 50, 100m
→ High precision.

(iv) Steel tap :— 6-10 mm width steel tap is available in 1, 2, 10, 20, 30, 50 m. brass ring is attached. More accurate than metallic tape

★★★

Ranging or Ranging out of survey line :—

(i) For the measurement of the length of survey line, the chain or tap is stressed along the line joining the end stations.

(ii) If the ~~end~~ distances between end stations is more than one chain length then it is essential to provide intermediate stations b/w the end stations. This will ensure that the straight distance is measured b/w the end stations.

(iii) The process of establishing intermediate points on a straight line is known as <u>Ranging</u>.

(iv) There are two method of ranging.
(a) Direct ranging (b) Indirect ranging

- By Eye
- By line Ranger

(a) Direct Ranging ⇒ Direct ranging is done when two survey stations of survey line are intervisible and chain can be stressed easily or laid down easily. Direct ranging can be done by

(i) By Eye judgement:—

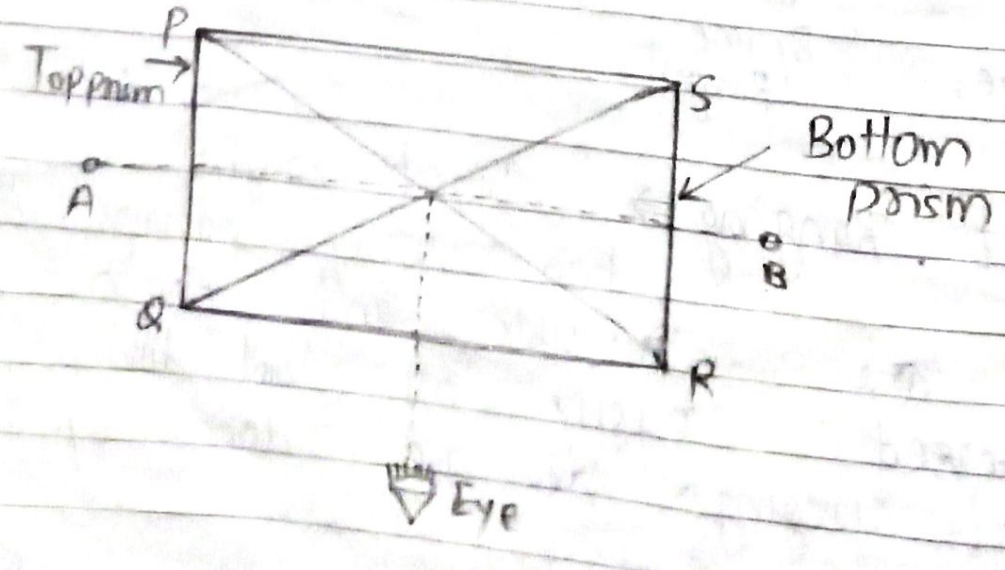
Let A & B are the two stations of a survey line and distance need to be determine of this line by chaining So we need to stretch the chain along the line AB. Let us assume the distance blw stations A & B is more than one chain length.

→ So In order it is essential to ensure that the chain is stressed straight.

→ In direct ranging by eye judgement minimum three ranging rods are required one each on end stations A & B and one used for establishing intermediate point

→ The surveyor (instructor) stand at the end stations and give instruction to the follower to be in line with end stations. by eye judgement.

(ii) By line ranger :—



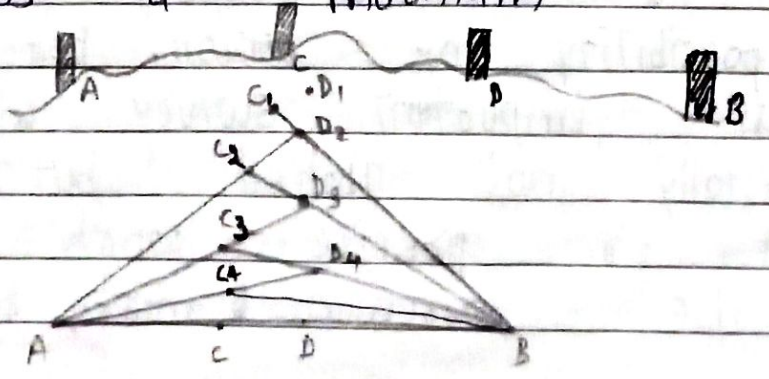
(a) A line ranger is a surveying instrument used for establishing intermediate points during ranging without actually going to either end of the survey line.

(b) The biggest advantage of a line ranger is that no assistente is required while using line ranger and the surveyor himself can establish intermediate points.

(c) A line ranger consists of to right angle triangular prism placed one above the other. In figure the diagonal of two prism are silvered so as to form the reflecting surfaces to reflect the incidental rays

(d) In order to hold the instrument in hand a handle with a hook is provided at the bottom of line ranger. The hook is also useful to attach the plumb bow.

(2.) Indirect ranging ⇒ When the end point of the survey line is not intervisible due to rising ground b/w them or due to long distance b/w the ends. Then indirect ranging is done, to layout a straight line b/w in excess point or points across a mountain



→ Let us assume two stations A & B which are not intervisible in above figure. Two ranging rods will be fixed on two station A & B.

→ Now two assistent will take two ranging rod and take positions at C_1 & D_1. In such a way that the assistant at C_1 can see the ranging rods at D_1 and B. Similarly assistant at D_1 can see the ranging rods at C_1 & B.

→ Now the assistant standing at C_1 will direct the assistant at D_1 to move a position D_2.

→ In such a way that now C_1, D_2 & B are in one line.

→ Similar instruction given by D_2 to C_1 to move a new position so that A, C_2, D_2 be in same range and so on.

→ By repeating the above processor of the 4 point A, C_1, D_1, B come in one line or same range.

Tape correction :—

A linear measurement is done by a chain or tape, there are many possibility of error. For small or less important survey corrections are generally not applied but when any important or precise work is done then the correction must be applied.

And the correction applied in tape measurement are known as tape correction.

→ A correction is positive or negative both. When the uncorrected length is to be increased positive sign is wed and negative when it is to be decreased to get the true length.

→ In precise taping, the following correction should be applied to the measured distance.

(i) Correction for absolute length (Standardization)
(ii) Correction for temp.
(iii) Correction for slope.
(iv) Correction for pull
(v) Correction for mean sea level (MSL)
(vi) Correction for aligment
(vii) Correction for sag

(i) Correction for absolute length ⟹

→ Correction for standardization is applied when the actual length of the tape is different from the standard length or nominal length.

$$C_a = \frac{L}{l} \times C$$

where L is a measured length of any line on the field
l is a nominal length of the tape.
C is correction per tape length with sign conventional

→ If the length found of the tape is more than the standard length the correction will be positive, as the measured length will be be shorter than the actual length of any line. Similarly if the length found of tape is less than the standard length the correction will be negative.

2.1 Correction for pull :—
(Tension) |→ If the pull applied to the tape during measurement is more than the standard pull at which the tape was standardised, then the length of tape is increases hence the distance measured becomes less than the actual.

→ The pull correction C_p is given by $P-P_s$ on AE multiple L

$$C_p = \left(\frac{P-P_s}{AE}\right) L$$

C_p represent the correctional of pull
P_s = Represent the standard pull
P = Pull applied during measurement
A = Area of Cross-section of the tape.
E = Modulus of elasticity of the tape.

E, for elastic tape is 2.1×10^5 N/mm²
E, For Invar tape 1.54×10^5 N/mm²

L = measured length

→ Correction for pull is positive if the pull applied is more than the standard and negative if the applied pull is the less than the standard pull.

3.) Correction for temp. :—

The length of the tape changes due to changes in the temp. during taking the measurements. The temp. collection C_t is given by

$$C_t = \alpha (T_m - T_o) \times L$$

T_m :- mean temp during measurement
T_o :- Temp. of standarization of tape.
L :- measured length
α :- Coefficient of thermal expansion.

→ α for steel tape is 3.5×10^{-6} per °c
→ α for invar tape is 1.22×10^{-7} per °c

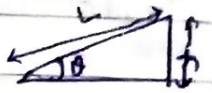
→ Correction for temp is positive, if the temp. during measurement is more than the standard temp. And Negative if the temp. during measurement is the less than the standard temp. at which the tape was standardized.

4.) Correction for slope :—

Mostly the ground survey are not flat tewrain the ground have

undulations. When on such grounds chaining is done we need to apply a slope correction in order to compute the straight distance.

$$C_g = \Sigma L (1 - \cos\theta)$$



$$C_g = (\sqrt{L^2 - h^2}) - L$$

$$C_g = \frac{-h^2}{2L}$$

where C_g = correction for slope
L = measured length
h = level difference b/w the ends of tap
θ = Angle of slope

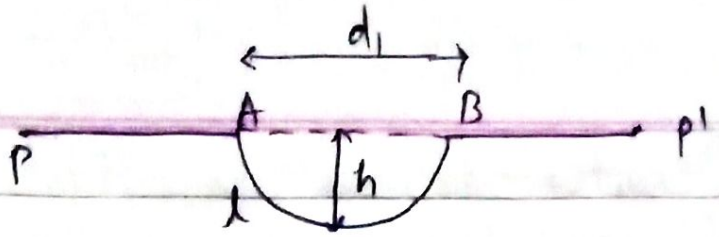
(5.) Correction of sag :—

If the higher accuracy is required rather than laying the tape along the around, it can be suspended b/w tripod heads then it is essential to apply a sag correction if the tape has been standarized on the flat.

For determination of correction, the sagged ~~ocuu~~ curved is assumed to be a parabola. and the sag correction is given by the following formula

$$C_s = \frac{-w^2 l^3}{24 p^2}$$

The sag correction in this case is negative.



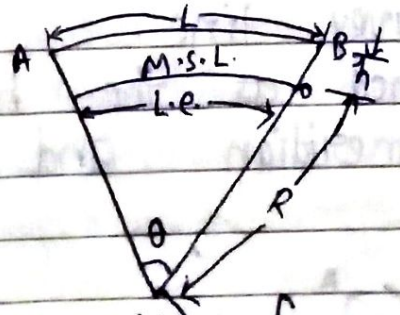
w = weight of tape per unit length (N/m)
P = Applied pull (in N)
l = length of the tape suspended b/w two points.

(6.) Correction for MSL :— The measured length at different altitude are some times reduced to a comman level, generally mean sea level. We know that the earth is spheroidal in shape. The measured distance at any altitude 'h' above the MSL would be great than the equivalent length at MSL.

→ Let the shape of the earth is sphere of radius R and consider the distance AB measured as L at an altitude of h above the MSL. The correction is given by

$$C_h = \frac{-Lh}{R}$$

the correction is -ve.



(7.) Correction for alignment ⇒ A correction applied to the measured length of a line to allow for not holding the tape exactly in a vertical plane of the line.

$$C_a = \frac{d^2}{2L}$$

Compass surveying :-

Compass surveying is that branch of surveying in which a direction measuring instrument such as compass is used to determine the location of any point or object.

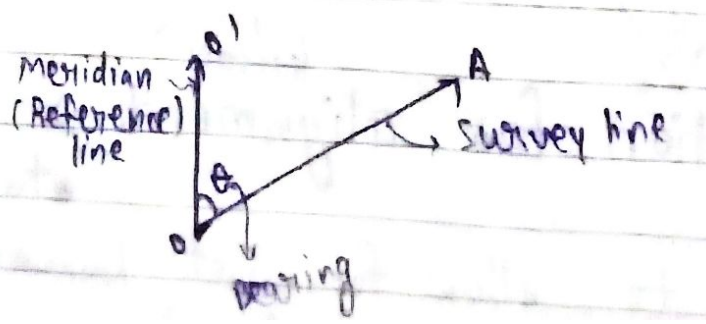
→ Compass survey is used to survey an area in which network of line starts from a point, goes around the area this is called traverse.

Meridian & Bearings ⟹

The reference direction from which position of any line is referred, known as meridian.
And the angle measured from meridian is called Bearing.

→ Meridian can be defined as the reference with which respect we can find out the bearing of any survey line.

→ Bearing can be defined as the horizental angle between the meridian and the survey line.

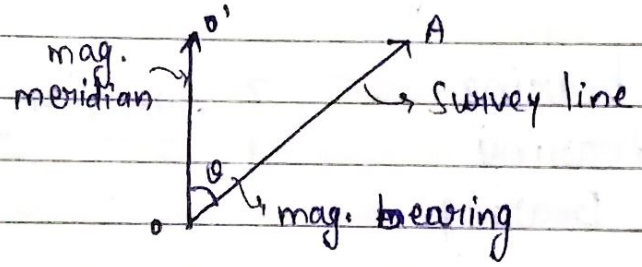


Types of Meridian :—

(i) Magnetic meridian
(ii) True meridian
(iii) Arbitrary meridian (Assumed meridian)

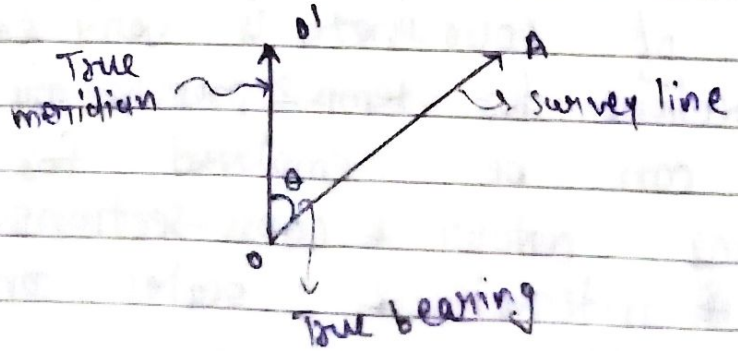
(i) Magnetic meridian ⇒ It is the direction shown by needle a freely flotting and balanced magnetic ~~middle~~ which is free from all other attractive forces, is known as magnetic meridian.

→ Magnetic compasses are used to establish the magnetic meridian.



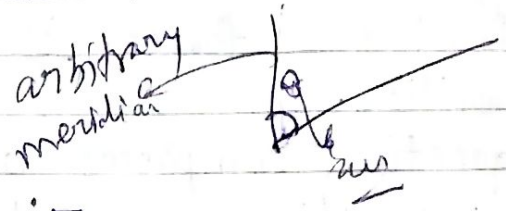
(ii) True meridian ⇒ True meridian from any point is the line which passes through the geographical north and south poles and interset the surface of earth, such type of meridian is known as true meridian.

→ True meridian can be established by ~~compass~~ astronomical observation.



(9.) Arbitrary meridian :— (Assumed meridian) Arbitrary meridian, some times we are just concern with relative direction of few line and in such situation it is convenient to assumed any permanent mark or signal such as chemney, column etc as a meridian.

Such type of meridians are known as arbitrary meridian.



Type of bearing :—

(i) Magnetic Bearing
(ii) True Bearing
(iii) Arbitrary Bearing

} → describe

Total stations :— Total station is a surveying equipment combination of EDM instrument & electronic theodolite.

(horizontal, vertical & slope angles)

Advantages

→ Field work is carried out very fast.
→ Accuracy of measurement is high.
→ Manual errors involved in reading & recording are eliminated
→ Calculation of coordinates is very fast & accurate.
→ Even corrections for temp. & pressure are automatically made.
→ Computers can be employed for map making & plotting contour & cross-sections.
→ Contour intervals & scales can be changed in no time.

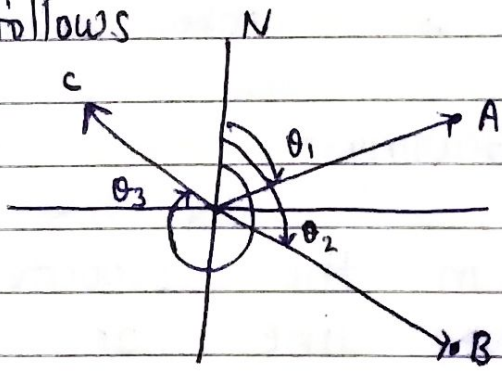
System / Designation of Bearing :-

Their are two systems which are used to measure the bearing are ~~who~~

(i) Whole cycle Bearing system (WCB system)
(ii) Quadantral Bearing system / Reduce B

(i) WCB system ⇒

(a) In whole cycle bearing system the values of bearing varies from 0° - 360°.
(b) In WCB system the assumed reference is always the magnetic north. (N)
(c) In WCB system the bearing can be measured only in clock wise direction.
(d) Prismetic compass is based on WCB system.
(e) The way of presentation of WCB system is as follows



N - θ1
N - θ2
N - θ3

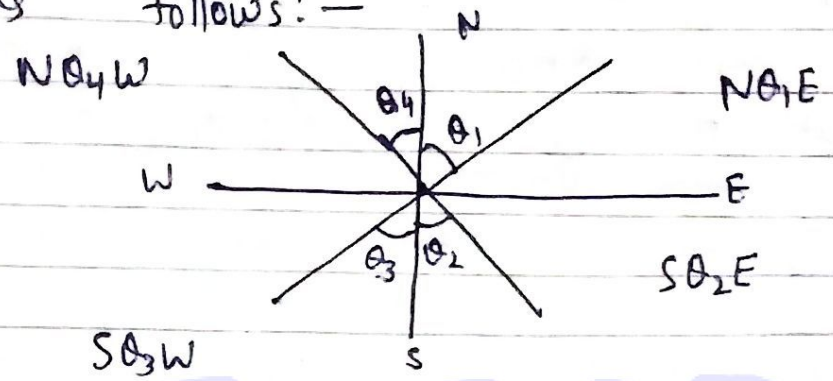
(ii) Quadantal Bearing system ⇒

(a) In QB system the value of bearing varies b/w 0° - 90°.
(b) In QB system the assumed reference is always the magnetic north & mag. south.
(c) In QB system the bearing can be measured

clock wise or anti clock wise both.

(d) The Survey-or compass is based on QB system.

(e) The way of presentation of QB system is as follows:—



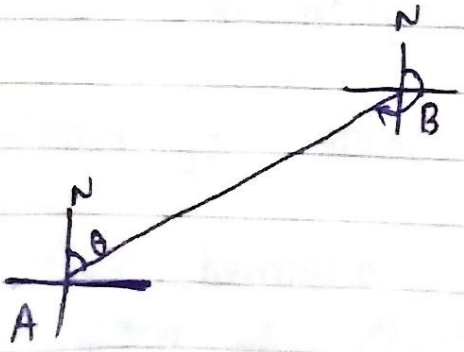
Fore Bearing & Back Bearing ⇒

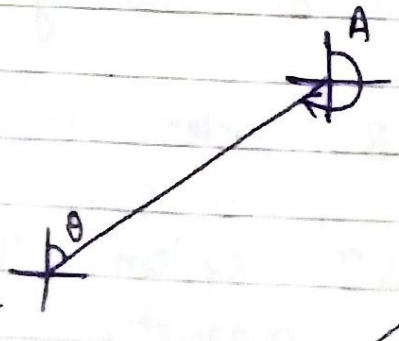
Foreward Bearing:—

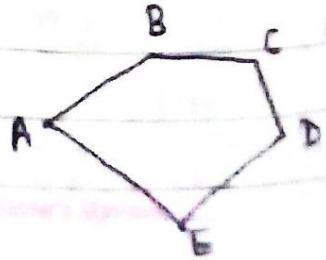
If the measurment of bearing is in the direction of the survey line or inforward direction then the measured bearing is fore bearing (forward).

Backward Bearing:—

If the measurement of bearing is in the opposite direction of the survey line or outward direction then the measured bearing is B.B.







$$BB = FB \pm 180^\circ$$

If FB > 180° then BB = FB − 180°
If FB < 180° then BB = FB + 180°

Convertion of Bearing :-

Q. Convert the whole cycle bearing into QB system.
Ay -

	WCB	QB
(i)	N-30°	N-30°-E
(ii)	N-60	N-60°-E
(iii)	N-120	S-60-E
(iv)	N-121°20'	S-58°40'-E
(v)	N-179°1'	S-1°59'E

Q. Convert the following QB into WCB.
Ay -

QB	WCB
N 1°10'E	N-1°10'
N 89°15'W	N-270°45'
S 20°10'E	N-159°50'
S 40°20'W	N-220°20'

Type of compass

(i) Prismetic compass :-

(i) The graduation circle is fixed to a ~~riddle~~ broad needle and it doesn't rotate with the

line of sight.

(ii) In prismetic compass there is a prism which is attached with on the a compass for and used to view the readings exactly.

(iii) In prismetic compass the graduations are based on WCB system.

(iv) The graduations are marked inverted.

(v) The magnetic needle do not act as index.

(vi) Tripod may or may not be provided. The instrument can be used even by holding suitably on hand.

(ii) Surveyor Compass :—

(a) The graduation circle is fixed to the box and rotate with line of sight.

(b) No prism are used in surveyor compass

(c) Only slit is attached to the compass box.

(d) The surveyor compass is based on QB system.

(e) The graduation in surveyor compass are read directly without inverting. So the graduation are marked directly.

(f) The surveyor compass is used with tripod - we cann't use it without any tripod.

Levelling

→ Levelling is a branch of surveying the object of which as

(i) To find the elevation of given points with respect to a given or assumed datum.

(ii) To established points at a given elevation or it different elevation w.r.t. a given or assumed datum.

→ The first operation is required to enable the works to be designed and the second operation is required in the setting out of all kind of engineering works.

→ Levelling deals with a measurement in a vertical plane.

→ Levelling is the art of determine the relative elevations of a point w.r.t. other point, whose elevation is already known to us. or to determine the relative elevation w.r.t. assumed or given datum.

Defination of Term used in levelling ⇒

(i) Level surface :-

Level surface is a curved surface that is ⊥ to the direction of gravity at every point. The surface of lack or pond is a truly level surface

(2.) Vertical line :-

Vertical line is the line which is along the direction of gravity. This line is indicated by a plumb bumb freely suspended. The vertical line is also known as plumb line.

(3.) Level line :- A line normal to the plumb line is known as Level line or it is a line lying in a level surface.

(4.) MSL (mean sea level) :-

For generations, the only way to express topographic elevation is to relate it to sea level. As it is believed that the sea surface is in balance with the earth gravity so that earth-matic mean of per hour water level of observe for a long period of 19 years is considered as mean sea level.

(5.) Elevation :-

It is the vertical distance of a point above or below the datum. It is also known as R.L. (Reduced level)

(6.) Bench mark :- It is the fixed reference point is known as bench mark, or It is the fixed reference point whose

elevation (R.L.) is already known to us w.r.t. assumed datum.

(7.) Foresight :- It is the staff reading on a point whose elevation to be determined or on a change point (turning point). It is also known as minus sight.

(8.) Back sight :- It is the staff reading on a point whose elevations are already known to us (Bench mark).

(9.) Intermediate sight :- All sights taken b/w back sight and foresight.

(10.) Change point (T.P.) :- It is a point denoting the shifting of the level. It is the point on which the back sight and foresight both are taken.

(11.) Height of instrument (H.I.) :- It is the elevation of the plaine of collimation (plaine of sight) when the instrument is correctly leveled and it is also known as the height of plaine of collimation.

Methods of leveling :—

(i) Barometric
(ii) Trignometric
(iii) Spirit.

(i) Barometric leveling :—

Barometric leveling make use of the phenoming that difference in elevation b/w two points is proportional to the difference in atmospheric pressure at those points.
A Barometer may be used to determine the atmospheric pressure.

(ii) Trignometric or indirect leveling :—

Trignometric /indirect leveling is the process of leveling in which the elevations of points are computed from the vertical engles and the horizental distances measured in the field, just as the length of any sight at any triangal can be computed from proper trignometric relations in a modify form it is known as Stadia leveling.

(iii) Spirit leveling :—

(Direct leveling) In spirit leveling a spirit level and a sighting devices (telescope) are combine and

vertical distance are measured by observing on graduated rods (staff) placed on the point. This method is also known as direct leveling and it is the most precise method of determining elevation and the most commonly used by engineers.

Leveling instruments ⇒

The instrument commonly used in direct leveling are

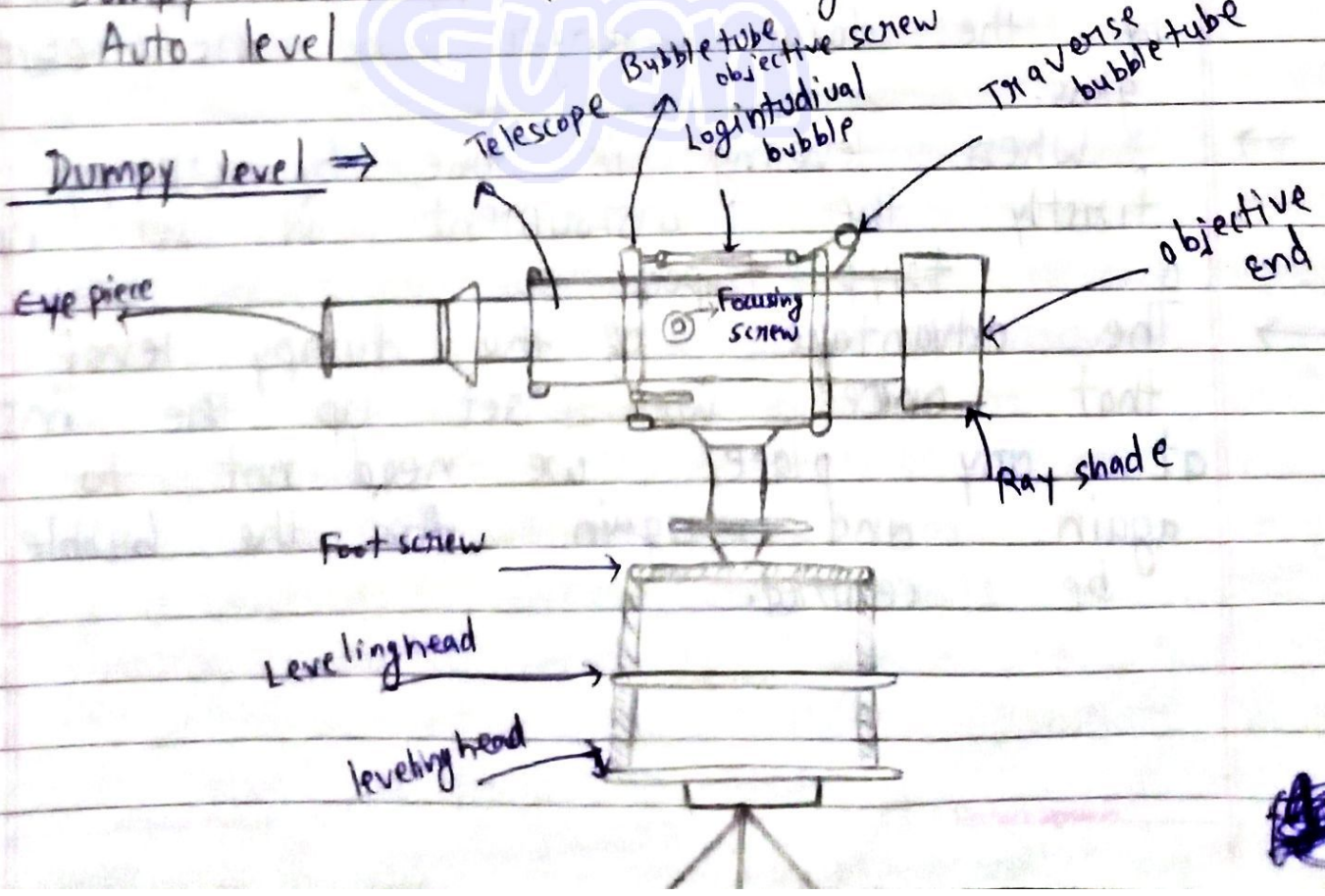
(i) Level instrument
(ii) Leveling staff

(i) Level instrument :-

Following level instruments are used in direct leveling:-

(A) Dumpy level (B) Tilting level
(C) Auto level

(A) Dumpy level ⇒



→ Dumpy level consist of a telescope which is fixed on a vertical spindle and this spindle revolve in the socket of the (L.H).

→ The levelling head consist of two parallel plates with three or four levelling screw.

→ The upper plate is known as tribach and lower plate is known as trivet

→ The telescope can be related about its vertical axis but in Horizontal plain.

→ The telescope of the dumpy level can be focused internally and so it is called internal focusing type.

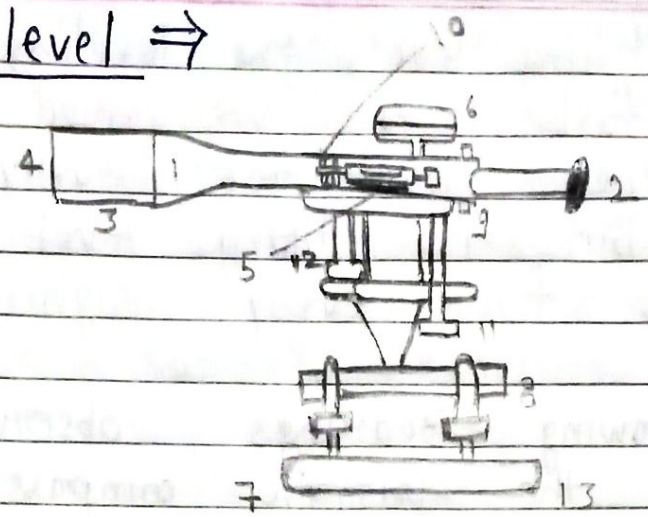
→ A sensitive level tube is fitted on the top of telescope. And when the instrument is proper horizontal the bubble of the spirit tube is exactly in centre.

→ The size of the dumpy level is defined by the focal length of the object glass.

→ When leveling is done by dumpy level firstly the instrument is set up on a tripod.

→ The advantage of the dumpy level is that once we set up the instrument at any place we need not to check again and again for the bubble to be centred.

2] Tilting level ⇒



End

1.] Telescope 2.] Eyepiece 3.] Ray shade 4.] Objective

5.] Level tube 6.] Focussing screw 7.] Foot screw

8.] Tribach 9.] Diaphragm adjusting screw

10.] Bubble tube fixing screw

11.] Tilting screw

12.] Spring loaded plunger 13.] Trivet stage

→ For precise & quick leveling, tilting level is commanly used.

→ The telescope of tilting level is not rigidally fixed to the vertical spindle.

→ In a tilting level, a tilting screw is provided so that the instrument can be tilted about the Horizontal axis in a vertical plane, upward & downward through a small angle.

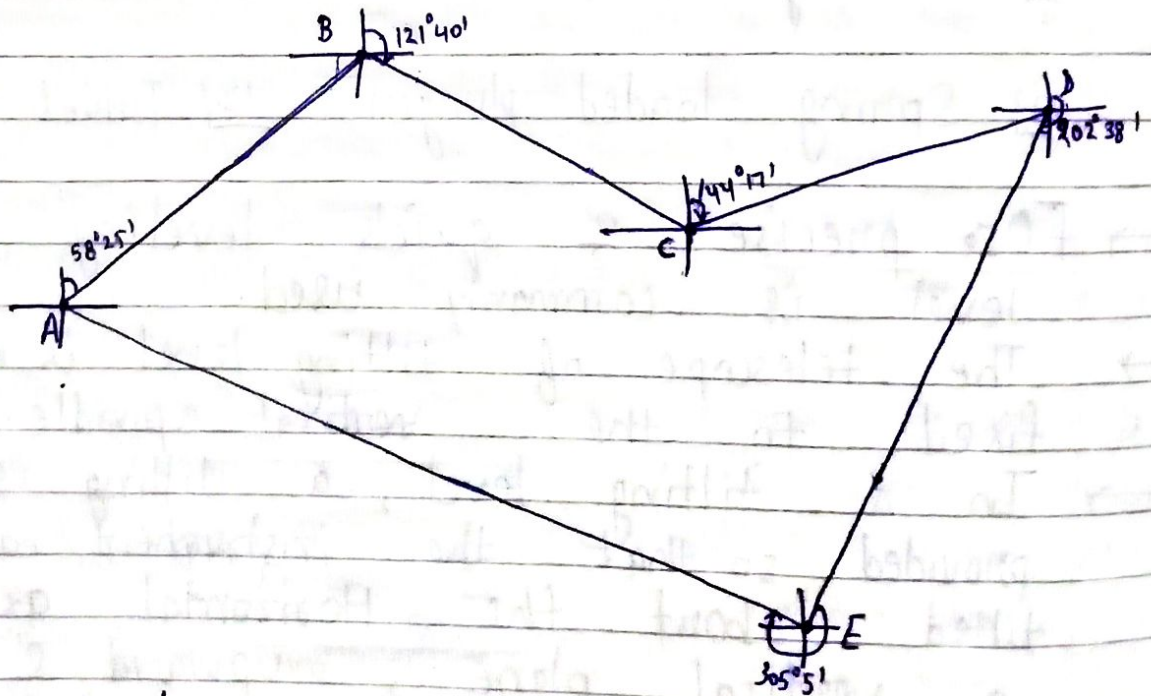
→ The instrument is leveled roughly by the foot screw.

→ In a tilting level, the leveling of field is very fast as we need not to adjust the level for every new instrument setting. But in tilting level, we need to level it for every sighting of staff.

IMP Q. The following Bearings observe with the help of the prismatic compass. Calculate the ~~integral~~ included angle.

Line	F.B.	B.B.
AB	58°25'	238°25'
BC	121°40'	301°40'
CD	44°17'	224°17'
DE	202°38'	22°38'
EA	305°5'	125°5'

Ans -



∠ included angle = B.B of previous line − F.B. of Next line

$\angle A = 125°5' - 58°25' = 124°65' - 58°25'$

$= 66°40'$

$\angle B = 238°25' - 121°40'$

$\angle B = 237°85' - 121°40' = 116°45'$

$\angle C = 301°40' - 44°17' = 257°23'$

$\angle D = 224°17' - 202°38' = 223°77' - 202°38'$

$\angle D = 21°39'$

$\angle E = 22°38' - 305°5' = -282°27'$

$-282°27' + 360° = 77°33'$

Sum of all interior angle of pentagon

$= (2n-4) \times 90 = (2\times5-4) \times 90$

$= 540°$

$\angle A + \angle B + \angle C + \angle D + \angle E$

$= 66°40' + 116°45' + 257°23' + 21°39' + 77°33'$

$= 540°$

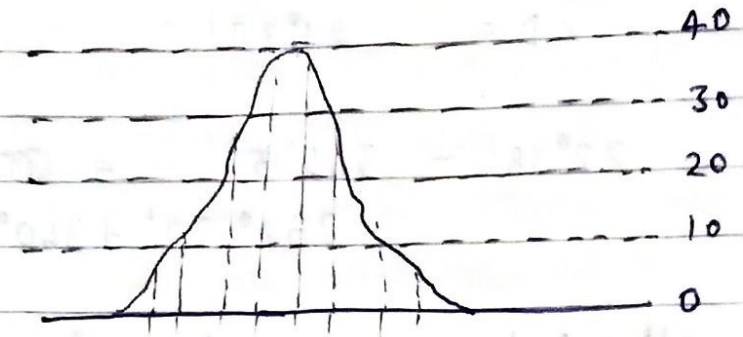
* Contour ⇒ A contour line may be defined as an imaginary line which is passing through the points of equal reduced level.

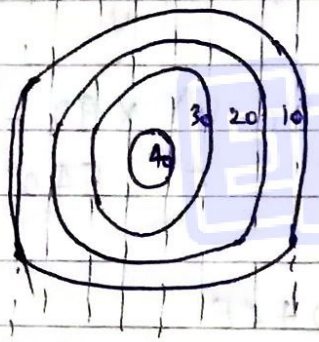
→ A contour line may also be defined as the intersection of a level surface with the surface of the earth.

→ Contour lines are used for preparing topographical map (contour map).

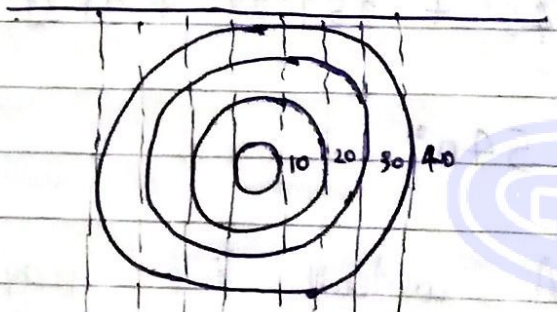
→ Topographical or contour map are those maps in which a horizental as well as vertical dimensions also represent.

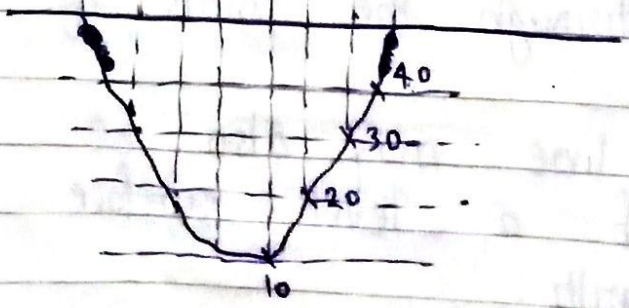
→ Their is a different pattern of contour map for represent diff. topographical feature (as shown in figure)





R.L. increases from outward to inwards, represents hills.





R.L. decreases from outward to inwards, represents depression / Lake / Pond / River

Building

Selection of site for building construction :-

(i) Before planing & construction of any building it is essential to select a suitable site properly. A properly selected site enhance the appear of the building without any expenditure

Requirement :—

(i) Natural resources ⇒ The site where the building is to be constructed should be situated on an elevated and leveled ground. It should not be situated near flat prone areas.

(ii) Stability of the soil at the site selected ⇒

The soil at the site should have good bearing capacity and it should be able to with stand against the load coming through the super structure. Black cotton soil and the soil having more moisture should not be prefer for any construction.

(iii) Drainage facilities in the site ⇒ The ground at the site should have good water table and it should be

high. If natural facilities for easy drainage of rain water exist ~~exess~~ in the area and it is secure economically. Then the site can be selected for the building or the structure.

(iv) The shape of the site should not irregular or having sharp corners. The ideal shape of site is square or rectangular.

(v) The site should be located in a developed area where the following facilities like medical shop, hospital, shopping centre, educational instution etc are available.

(vi) The site should not be located near industrial plant, emitting smoke, noise or other polluting agents. The site should be far from them.

(vii) Natural light and air should be sufficient in the site and the building should not get overshadow by the adjcent building.

(viii) Site should be selected at such place which comes under the byelaws of local authority.

Classification of Building ⇒

NBC (nation building code) of india defines the building as any structure for the purpose and materials constructed and every part of the structure or any wall enclosing and entented to enclose any land or space and size of the structure can be guidence according to NBC.

→ According to NBC the buildings are classified on the bases of occupancy are as follow

→ Group A Residencial Building
→ Group B Educational Building
→ Group C Institutional Building
→ Group D Assembly Building
→ Group E Business Building
→ Group F Mercantile Building
→ Group G Industrial Bulding
→ Group H Storage Building
→ Group I Hazard Building

(i) Group A (Residencial building) ⇒ These buildings include any building in which sleep accommodation is provided for normal residencial purpose with or without cooking or dinning or both facilities.
These buildings includes hotels, apartment house, flats, rooming houses etc.

(2.) Group B (Educational building) ⇒ These buildings include any building used for school, collages, or day care purpose for more than 8 hour per week involving assembly for instruction, education, or re-creation and which is not covered by Group D.

(3.) Group C (Institutional Building) ⇒ These buildings include hospitals, pannel institutions, mental hospital, prisons, jails etc.

(D) Group D (Assembly building) ⇒ These buildings include any building or a part of a building where group of people gather for amuzement, re-creation, social, religious, civil, travel and simlar purpose. Theatres, assembly hall, auditorium, exhibition hall, club room, museums, places of workship etc. are such type of buildings

(E) Group E (Bulsiness building) ⇒ These buildings are used for the transpotion of busines

F) Group F (Mercantile building) ⇒ These buildings

include any building or part of any building which is used as stores, markets, wholesale or retail office etc.
Also used for ~~transmission~~ transition of business.

(G) Group G (Industrial buildings) ⇒ These are the buildings where products or materials of all kinds and properties are fabricate, ~~SM wood or~~ processed. Assembly plants, laboratary, power plants, refinarys, ~~etc~~. are the example of such type of buildings.

(H) Group H (Storage buildings) ⇒ These buildings are used for the storage of goods. Cold storage ~~wh~~ ware houses and godown are the example of such buildings.

(I) Gropp I (Hazarad building):- These buildings or part of the building used for the storage including servicing, processing or repairing incidental to storage of goods.
This is also used for handling or manufacturing highly ~~convertible~~ combustible or explosive materials.

Classification based on type of construction ⇒

The type of construction according to fire resistance may be classified into four category.

(i) Type one construction :— All structural components offer ~~for~~ 4-hours fire resistance.

(ii) Type two construction :- All structural components offer 3 hours fire resistance

(iii) Type three construction :— All structural component offer 2 hours fire resistance.

(iv) Type four construction :— All structural component offer 1 hours fire resistance.

Component of Building and their functions ⇒

A building consist of following three parts

(i) Foundation or Sub-structure
(ii) Plinth
(iii) Super-structure

(i) Foundation ⇒ Foundation is the bottom most part of any structure which is directly contact with the sub-soil.

→ The main purpose of the foundation is to transfer the load of super structure to the soil.

→ Foundation may consist of concrete, stone & brick footing above base concrit.
→ The base of the foundation is known as 'footing'

2.] PLINTH ⇒
→ It is the portion of the structure above the ground upto the floor level of ground floor. The floor level of ground floor is called "Plinth level" or "basement level".
→ Plinth level is raised above the natural ground level so that the floor level of building is above the adjacent road level.
→ When the bearing capacity of the soil is non-uniform, an RCC ~~beam~~ beam at a plinth level protect the super structure from uneven settlement and dereloperment of moisture from the ground.
→ The damp proof course (DPC) just at the plinth level to prevent the moisture from the ground.
→ The height of plinth may be 300mm to 600mm but 450mm is more common. For water logging prone areas the plinth height will be a minimum 600mm.

3.] Super Structure ⇒ It is the portion of the building above the ground level.
Super structure has the following components:-

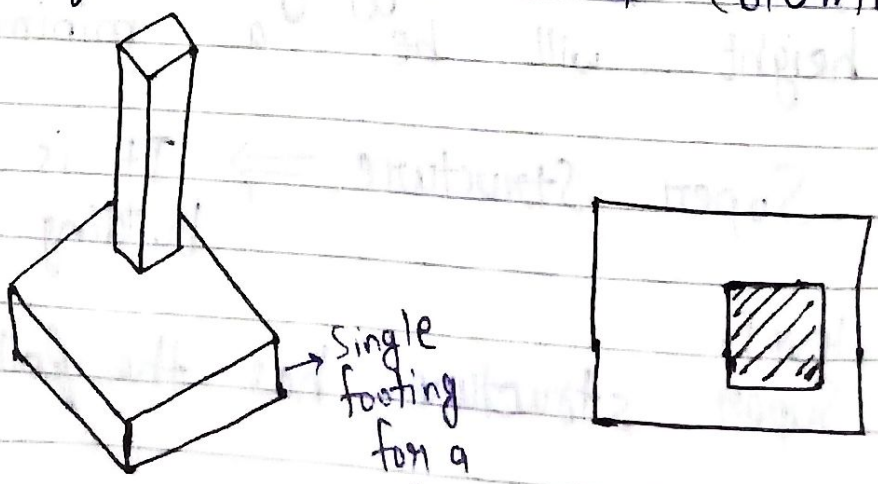
(i) Masonary goal, coloums etc.
(ii) Steps & stairs
(iii) Lifts and ramp
(iv) Door window & ventilater
(v) Lintels
(vi) Sun shade & ~~cha~~ chhajjas
(vii) Roof
(viii) Building finishes
(ix) Parapet wall

Types of Foundation :—

(i) Open / shallow foundation ⇒

→ Shallow foundation is that type of foundation in which the depth of the foundation is equals to or less than the width of the foundation
→ The depth of shallow is till 5meter.
→ Shallow foundation can be further classified as the following :—

(i) <u>Spread footing</u> ⇒ Spread footings are the footings which spread the super ~~inforce~~ impose of load of a wall or a column



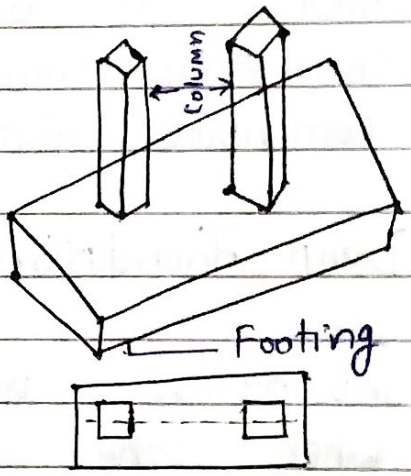
(ii) Raft footing :- It consist of a slape at its bottom over the entire area of construction and resting on sub soil. Beams resting over the slape ~~sp~~ support columns over them.

→ Raft foundation is used when the load of the super structure is very heavy and the bearing capacity of the sub soil is lesser.

→ When the settlement of individual foundation are quite high, raft foundation adopted.

→ Raft footing is also known as mat foundation.

(iii) Combined footing :-

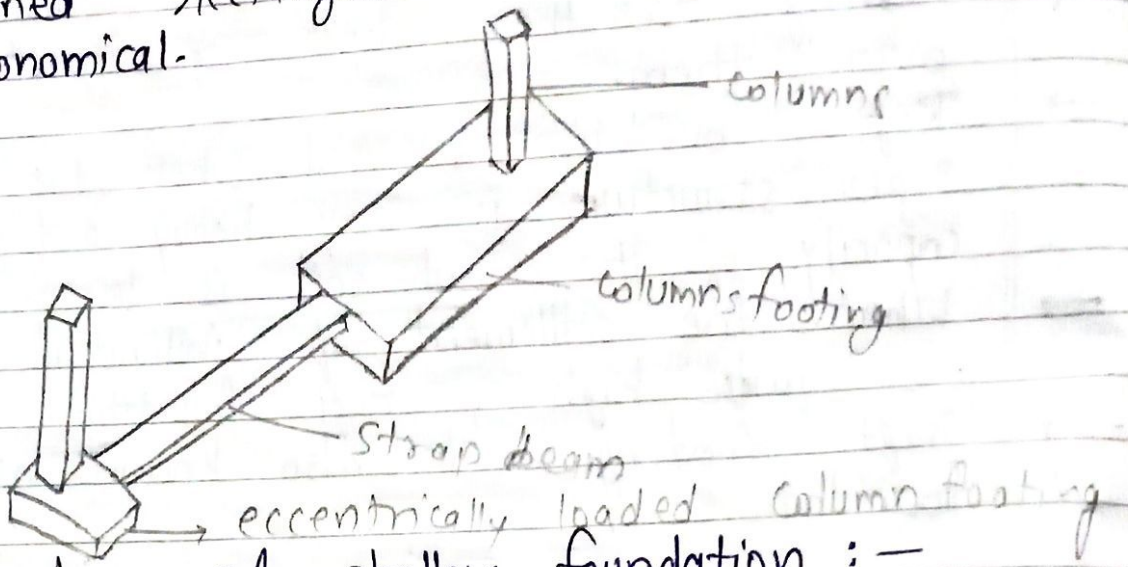


→ When two or more columns are supported on a spread footing, known as combined footing.

→ Some times when columns are located very near to each other and isolated footing is practically difficult, it is always economical to provide combined footing in such cases.

(iv) Strap footing :- For strength & stability purpose, isolated footings are connected by a beam. Such footings are known as Strap footing.

→ A strap footing may be used when a distance blw the column is so great that the combined rectangular footing becomes highly uneconomical.



Other type of shallow foundation :—

(i) Cantilever footing
(ii) Continuous footing etc.

(ii) Deep foundation ⟹ A foundation is said to be deep when the depth of foundation is more than its width.

→ When the bearing capacity of the soil is not able to with stand against the loads coming from the super structure then higher depth of foundation is required to transmit the load to a hard stratum having enough bearing capacity.

→ ~~With~~ If the depth of the foundation is more than the 5 meter then the prefer foundation is deep foundation.

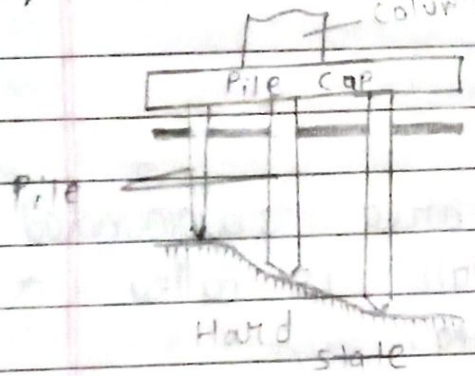
Types of deep foundation :—

(i) Pile foundation ⇒ It is a such type of deep foundation in which the loads are taken to a low level by means of vertical members which may be of timber, steel, or concrete.

→ Pile foundation may be adapted in following cases :—

(A) When there exist firm bearing strata but constructing spread footing becomes uneconomical.

(B) When Sub soil water pumping is to costly.



(ii) Well foundation ⇒ Well foundations are box like structure, which can be circular or rectangular, which are sunk or penetrate from the surface of land or water to the desire depth.

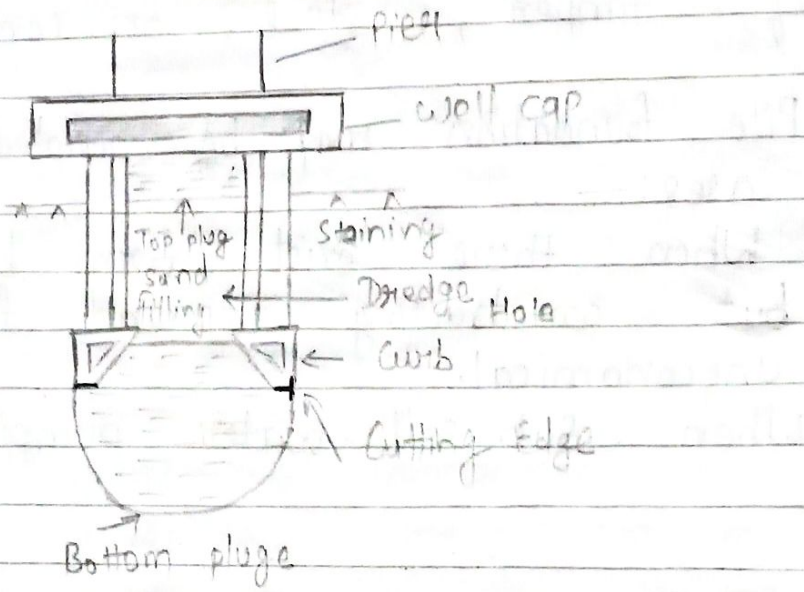
→ They are much large in diameter than the pile foundation.

→ Such foundation is used for

(i) Bridge & Abutment in the rivers or lakes etc.

(ii) Large water front structures such as pump house, subjected to heavy vertical & horizontal loads.

(iii) Break water structures or offshore protection structure.



(A) Plinth Area :- It is the area surrounded by a boundary wall is called a plot area or plinth area.

→ Plinth area is the built up covered area of a building measured at floor level of any storey.

→ Plinth area is calculated by taking the external diamensions of the building at the floor level excluding the plinth of offsetts

Plinth Area = Plot area − Set Back Area

→ As per local municipal authoritise guidlines

we need to provide some empty space around the building. This empty space or area provided is called setback area.

Included in the Plinth area :—
(i) Area of porches other than cantileveres.
(ii) All floor area, area of wall at the floor level exluding plinth offset.
(iii) The area of bursati and the area of 'Munty' at terrace level. ~~not~~

Not included in the plinth area.
(i) Sunshade (ii) Balconies
(ii) Cantilevers projection
(iv) Open areas etc.

(B) Carpet Area :— Carpet area is an area which is enclosed with in the wall. In other words, Area excluding walls in the built up area is known as carpet area.

Carpet Area = Plint Area - Area Under walls

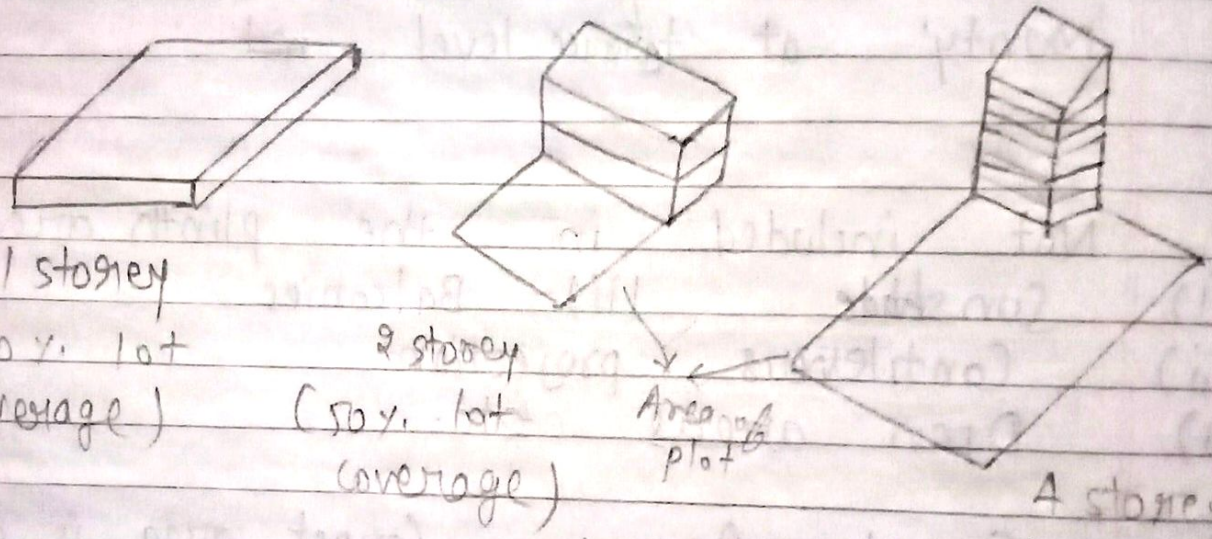
→ Carpet area is around 85-90% of built up area and it is the useful area or lettable area.

→ Carpet area = Total Floor Area - ~~Su~~ Circulation Area of coridoors, stair, lift

— non usable area as synitary accomodation, airconditioning room etc

→ For office area the carpet area is around 60-75% of plinth area.

(c) Floor space index ⇒
(Floor area ratio [FAR])



It is a ratio of the plot size on which the construction happens and the total permissible coverage area.

Basic Concept of RCC ⇒ RCC is a Reinforced cement concrete, one of the most widely used construction material.

→ In RCC, Reinforcement (steel bar) & concrete both are used having different properties but both act like a unit

→ Concrete is good in compression and steel reinforcement good in tension.

→ Concrete is weak in tension so the resistance against the tension forces is very low. So that Concrete can be used only when there is only pure compression. The steel reinforcement impart flexibility in the structure.

Advantage ~~Properties~~ of RCC :—

(i) It is fire resisting.
(ii) It is almost impermeable.
(iii) It is durable.
(iv) The maintenance cost of RCC is very little.
(v) It can not be attacked by termites.
(vi) The RCC structure can be designed for any desire load.

Uses of RCC :—

(i) RCC is used as a structural element (column, beam)
(ii) RCC is used for the construction of storage structure like water tank, dams etc.
(iii) RCC is used for the construction of heavy structure.
(iv) RCC is used in pre-cast structure.
(v) RCC is used in railway's slipper.
(vi) RCC is used for Pavement construction.

Building Byelaws ⇒

(i) The building byelaws are necessary to achieved the following object —

(A) Building byelaw provide guidelines to the architech or engineers to help in pre-planning the building activities.
(B) Building byelas provide growth and prevent health hazard developement
(C) Provission of byelaw deals with structural failure, health hazard construction, safety against fire etc.

Principles of building byelaws ⇒

(A) Specify minimum size of plot, their dimension and front edges.
(B) Specifies set back area and marginal spaces
(C) Making compulsary the appointment of an architech or engineer for works of specify natural and magnetitude.
(D) Insisting on suitable FSI or FAR.
(E) Specifing suitable arrangement with respect to drainage & water supply.
(F) Controlling projections in margion spaces.
(G) Controlling height of structures and maximum limit of height in certain zones.
(H) Specify the height of compound hole and location of compound hole gates.

(I) Classify the building with unit as the family at ~~matching~~ mentioning the requirements.

(J) Classify the rooms according to use and then specifing minimum standard of each room w.r.t. size. ~~sight~~, height, floor area, ventilation and line.

Sunlight and ventilation ⇒

Ventilation ⇒ Ventilation may be defined as a process of removing or supplying air by natural or mechanical means.

Types of Ventilation

(i) Natural Ventilation :— A natural ventilation is nothing but the supply of outside air into a building by the windows or other openings.

Ventilation of the building is essential because of verious functional requirements. Such as

(A) To prevent under concentration of dust, bacteria carring particals, carbondi-oxide moisture, fumes, and other industrial products etc.

(B) To create the air movement

(C) To maintain the conditions suitable to the contain of space.

(D) To remove the products of combustion, body heat and the heat libirated from the operation of certain equipments.

(ii) Mechanical or artificial ventilation ⇒ In this system of ventilation the outside air is supplied into a building either by positive ventilation or by infilteration, by reduction of pressure inside due to exhaust of air, or by combination of both.

Methods of mechanical ventilation :—

(i) Extract or Exhaust system
(ii) Supply or planum system
(iii) Air conditioning

Q.1 Write the mode of transportation briefly.

Ans- Movement of human, animals or goods from one place to another is known as transportation. Transportation contributes to the economic, industrial, social & cultural development of any country.

→ Transportation is the key for the economic development of any country or region as commodity produced viz. food, industrial products etc needs transportation at all stages from their production / manufacturing to distribution.

There are 3 basic modes of transportation i.e. land, water & air. Land is road & rail transportation. So following are the four modes of transportation :-

(i) Roadways
(ii) Railways
(iii) Waterways
(iv) Airways

(i) Road ways ⇒ The most convenient and 'nearest to people' mode is roadways. Roadways have the maximum characterstics of roadways can be listed as under :
flexibility in terms of route, direction, time, speed of travel etc.

(i) Road transport require relatively small investment for the government.

(ii) Roads are used by various type of road vehicles like passenger cars, buses, trucks, pedal cycles.

(iii) Road transport is the only mode through which door to door service can be provided.

(iv) For short distance travel, road transport saves time.

(v) Road transport offers freedom & flexibility to the user to change the lane and route according to need and convenience

(ii) Railways :— Though the railways required a very huge capital investment as compared to other modes of transportation, it is our principle means of transportation. It carries about 70 to 80 % of our total world.

Characteristics of railway are :—

(i) Railway has monopoly in india. The rail transport is managed by railway department of the central government. No private operator is allowed to enter this transport system.

(ii) The railway require huge investments for purchase of land, tracks, station & shed etc.

(iii) Once the railway tracks are laid down then these tracks cannot be used for any other purpose. So railway service are non-transferable.

(iv) Travelling charges are lower in long distances, as compared to roadways.

(v) It is a fast mode of transportation as there is no traffic barriers, check posts or any hold ups.

(iii) Waterways ⇒ Water transport is the cheapest & the oldest mode of transport. It operates on a natural track & hence does not require huge capital investment in the construction & maintenance of its tracks except in case of canals.

Characteristics of waterways are :-

(a) River & oceans are natural ways, which does not require any cost of construction & maintenance.
(b) It can carry much larger quantities of heavy & bulky goods such as coal, timber etc.
(c) The risk of accidents & breakdown are least as compared to any other mode of transportation.
(d) Speed of inland water transport is very slow and therefore this mode of transportation is unsuitable where time is an important factor.
(e) Rivers & canals cannot be operated for transportation throughout the year as water may freeze during winter or water level may go down during summer. Similarly oceans have tides or storms which become unsuitable for transportation.

(iv) Airways ⇒ Air transport is the most recent mode of transport. The unique

characteristic of air transport is that it does not require a specific surface track for its operation. It has no physical barrier as in the case of other modes of transportation. It is fastest mode of transportation but the cost of its operation is very high.

Main characteristic of airways are:—

(i) Air transport provides unbroken journey over land & sea.

(ii) It is the fastest & quickest mode of transportation.

(iii) It is preferable for long distance transportation.

(iv) It is not used for mass public transport.

Q.2 Draw the Road traffic signs.

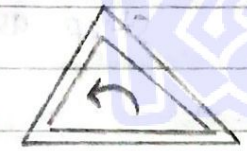
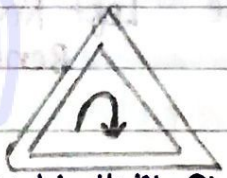
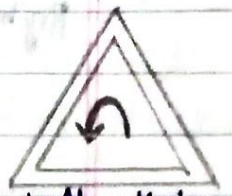
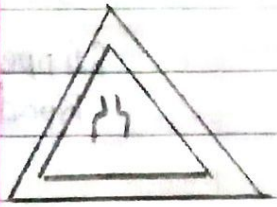
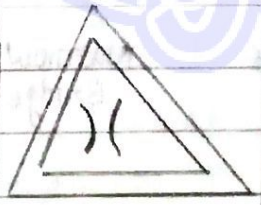
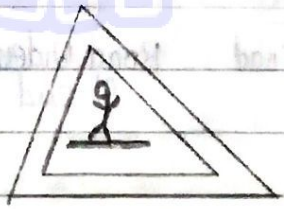
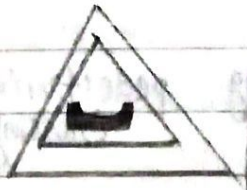
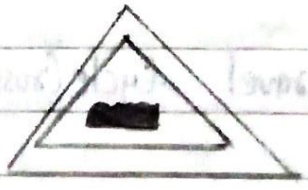
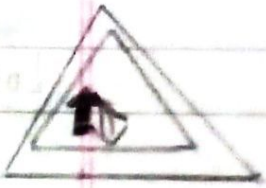
Ans Be it the person behind the wheel or a pedestrian, having a sound knowledge about road safety is absolutely necessary for all before going on the roads. Traffic sign give information about the road conditions ahead, provide instruction to be followed, warn & guide drivers & ensure proper fuctioning of road traffic.

Road Safety signs are primarily of three types:—

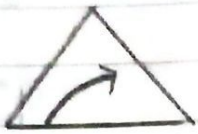
(i) Mandatory signs (ii) Cautionary signs

(iii) Informatory signs

(i) Mandatory Signs:— These signs are used to ensure free movement of traffic & make the road users aware of certain laws, and regulations, restrictions & prohibitions.

Stop 	Give way 	Straight Prohibitor No Entry 	Pedestrain Prohibited 
Horn Prohibited 	No parking 	No stopping or standing 	Speed Limited 
 Right Hand Curve	 Left Hand curve	 Right Hair Pin Bend	 Left Hair Pin Bend
 Narrow Road ahead	 Narrow Bridge	 Pedestrain Crossing	 School Ahead
 Round About	 Dangerous Dip	 Hump or Rough	 Barrier Ahead

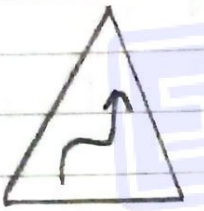
2.) Cautionary Signs:— These sign make the road users aware of hazardous conditions on the road ahead. The drivers accordingly take necessary actions to handle the situation. Son


Right hand Curve

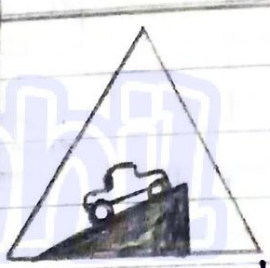

left hand Curve

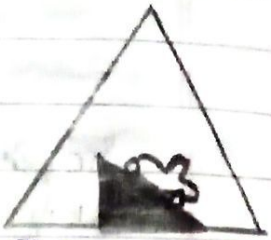

Right Hair pin Bend

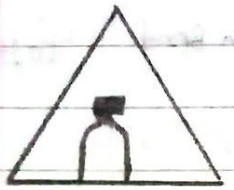

Left Hair pin Bend

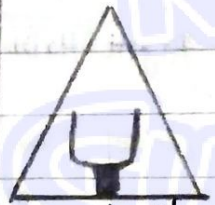

Right Reverse Bend

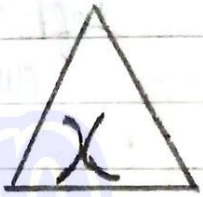

Left Reverse Bend

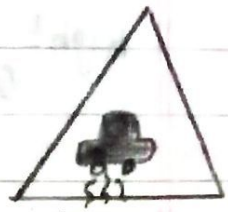

steep ascent


steep descent

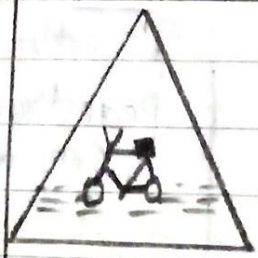

Narrow Road Ahead

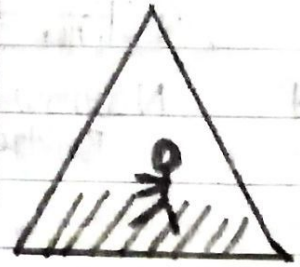

Road Wideness Ahead


Narrow Bridge


Slippery Road


Loose Gravel

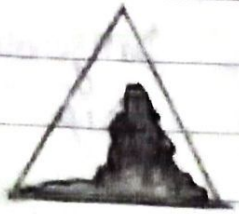

Cycle Crossing


pedestrain Crossing


School ahead


Men at work


Cattle


Falling Rocks


Ferry

3] Informatory Signs :— These signs guide the road users about destinations, distance, alternative routes & prominent locations like food joints, public toilets, near by hospitals etc. Some informatory signs are shown in figure 3

Public Telephone

Petrol Pump

Hospital

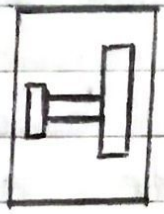
First Aid Post

Eating place

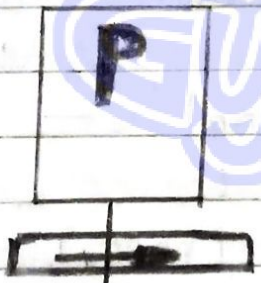
Light Refreshment

Resting place

Thorough Road

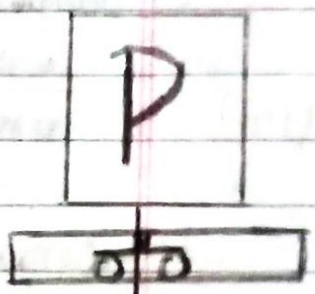


Thorough Side Road

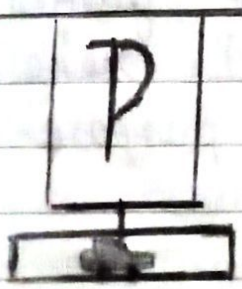


Park this Side

Parking Lot Scooter & Motor Cycle



Parking lot Cycle



Parking Lot Cars

Transportation and Traffic Road Safety

Cause of Road accident ⇒

(i) Overspeeding
(ii) Talking on phone
(iii) Drunk driving
(iv) Riding without helmet
(v) Not wearing seat-belt
(vi) Breaking Traffic rule
(vii) Driving in fog
(viii) Poor road infrastructure

Road Safety ~~assignment~~ Assesment ⇒

(i) Manditary vechile fitness check for all vechiles
(ii) Manually annual fitness check of the school, buses, trucks as well as drivers.
(iii) Heavy planety and fine for drunk driving.
(iv) Installation of more CCTV cameras for better monitoring of traffic.
(v) Make driving lincense and driving test strickly
(vi) Enforcing the heavy vechile to fix the reflective tape over them to be clearly visible during night.
(vii) Fly overs, grade separator, service road, sign boad and other safety fitu features have to be the primary focus.

(viii) Need to provide well maintain and safe transport system

(ix) Need to follow and organise road safety programs in india on a regular base

★ Traffic Engineering ⇒

Objective:— The basic objective of traffic Engineering is to achieve free and rapid flow of traffic with least no. of accidents. For this various studies are carried out:—

(i) Traffic characteristics
(ii) Traffic studies & analysis
(iii) Traffic control regulation

Function of transport:—

(i) Transport contribute in growth of industries whose product required quick marketing.
(ii) Transport helps in increase the demand for goods.
(iii) Transport create type utility
(iv) Transport helps in stablisation of price.
(v) Transport increases mobility of labour and capital

Environment Engineering

Various Act and Regulation for Environment protection ⟹

(i) Wild life protection act (1972) :—

This act is mainly concern with wild life conservation & protection of an dangered species both inside & outside of forest areas. This act prohibit hunting of about 50 species of animal, 43 birds and many reptiles.

Objective :—

(i) To preserve bio-digersity.
(ii) To protect and conserve wild life
(iii) To maintain & essential ecological process and life supporting system.

(ii) Water act (1974) :—

(i) Prevention & control of water pollution.
(ii) Maintaining and restoring water.
(iii) establishment for prevention and control of water pollution.
(iv) It established the standard for water quality and improve the water quality.

(iii) Indian forest act (1980) ⇒ This act has been passed to provide protection and conservation of forest. The main points in indian forest acts are

(A) Any land compose of predominantly tree and woody climbers can be considered as a forest

(B) Forest officers are appointed by gov. for purpose of carring out the duties and the objective under this act.

(C) Any offens to harm the forest punishable under this act and under any rule in this act.

(iv) Air act (1981) ⇒

(i) Prevention and control of air pollution.
(ii) Maintaining the quality of air.
(iii) Define the air pollution as any solid, liquid & gas present in air which harms human & other organism
(iv) Establishment of course for prevention & control of air pollution.

(v) Environment protection (1986) ⇒ The objective is are:—

(i) Protection & improvement of environment.
(ii) maintaining proper relationship b/w human being and the environment.
(iii) Makes rule and regulation related the environmental protection.

(iv) Makes rule & regulation for environmental pollution.

(v) Prevention of health hazards think to living organism.

Water Quality Standard ⇒ The standard can be adjusted according to technology and information to the water board and other agency such as

(1.) ISI (indian standard institution)
(2.) WHO (World Health Organisation)
(3.) ICMR (Indian council of medical Research)
(4.) USPHS (United state public health Sight)
(5.) MHWH (Ministry of work and Housing)
(6.) NDWM (National Drinking water management)

Some permissible limit of water w.r.t. some parameters are represented in table below.

S.N.	Parameter	WHO	
		Highest Desirable Limit	Maximum permissible Limit
1.	Colour	5 PCu	50 PCu
2.	Taste or Odour	Unobjectionable	U.O.
3.	Turbidity	5 JTU	25 JTU
4.	TDS	500	1500
5.	pH	7 - 8.5	6.5 - 9.2
6.	($CaCO_3$ mg/l)	100	500
7.	Calcium (Ca, mg/l)	75	200
8.	Magnesium (Mg, mg/l)	30	150
9.	Chloride (Cl, mg/l)	200	600
10.	Sulphate (SO_4, mg/l)	200	400
11.	Nitrate (NO_3, mg/l)	45	—

Floride (F, mg/l)	0.7	1
Iron (Fe, mg/l)	0.1	1
Magnese (Mn, mg/l)	0.05	0.5
Copper (Cu, mg/l)	1	3

Waste water treatment ☆☆

- Prilimimary
- Primary
- Secondary
- Testiary / Advanced Treatment

Prilimimary
- → Screening
- → Commoniting device
- → Grit chamber
- → Pre-aeration tank
- → Pre-chlorination

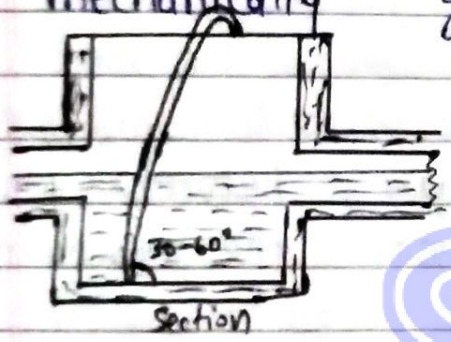
Prilimimary ⇒

(i) Screening :- Waste water contains coarse solid such as sticks, leaves, food objects and other large objects. And it is essential to remove such partical or object from the water.
To removing these object generally two types of screens are provided

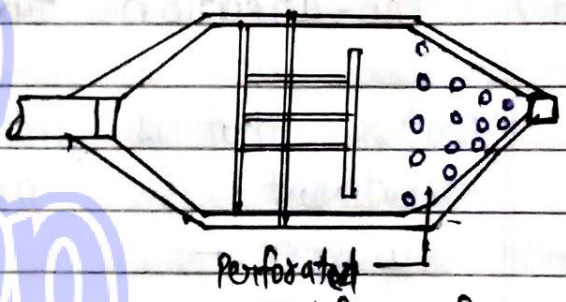
(A) Coarse screen (B) fine screen

(A) Coarse screen :- Coarse screen is provided generally for the partical or object which is around 20 to 60 mm or more and generally it consists of <u>verticals bars</u> that is also spaced very strong 20 to 60mm

(ii) Fine screen :- Fine screens are provided to retain the partical which is around 10 to 20mm size. And it consists of <u>perforated plate</u> which are attached with mechanically generated drums.



Fine Screen



Coarse Screening

(2.) Communiting device :-

→ It is also known as grinders, cutters etc.
→ These are the devices used for break or cut the solid to a size that they can be returned to the waste water without the danger of piping or affecting sub-sequent treatment.

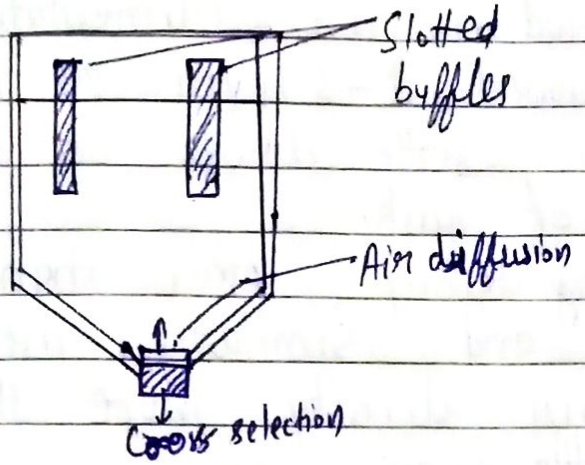
(3.) Grit chamber :— Waste water usually contain a relatively large amount of inorganic solid such as metal segment, sand, gravel etc. which are collectively known as grit. Grit can damage the pump by biaprasion affect so it is essential to remove these grit particals. And it can be remoned in chamber known as grit chamber.
Grit particals have tendency to settle down under gravity action or due to it self weight but the flow must be controlled

(4.) Pre-areation tank :—

Pre-areation of waste water that is introduced air before primary treatment is provided for the following reasons :—

(i) To obtain a greater removal of suspended soild in sedimentation tank.
(ii) It is helpful to removal of grease or oil carried in the waste water.
(iii) To fresh up septic waste water for further treatment.
(iv) BOD (Bio oxygen demand) Reduction
(v) In pre-areation tank the air is supplied into the waste water for a period of 20-30 min at the design flow. And this may be a

complished by compressed air into the waste water by mechanical agitation.



← pre-areation tank

(5.) Pre-chlorination :- Pre-chlorination is the chlorination of waste water before primary treatment. In this section the pre-chlorination is not related to disinfection and it is used related to either temparary preventing further waster water decomposition. or eliminating problems associated with the waste water decomposition.

Some objectives are

(i) Reduction of BOD
(ii) Protection of plant structure
(iii) Smell control

— Primary Treatment ⇒

(i) Primary treatment is designed to remove the organic or inorganic solid by physical process.
(ii) The physical process that we considered in primary treatment are sedimentation & floatation.

(iii) In primary treatment the velocity of flow is reduced to 1-2 ft per minute.

(iv) The detention period in the sedimentation tank will be around 2-3 hour so that the partical can settle down or sediment at the bottom of tank.

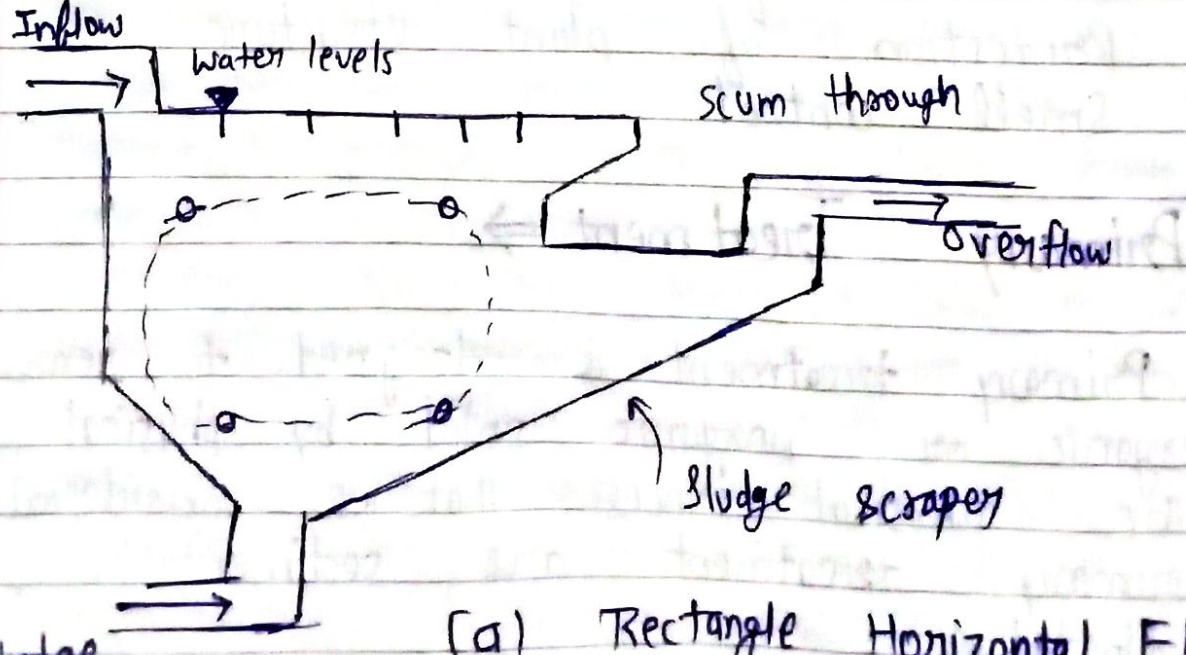
(v) The partical having density lesser than water will flow and similarly. the particals having density more then water will settle down.

(vi) Around 40-60% of suspended solid removed in primary treatment process.

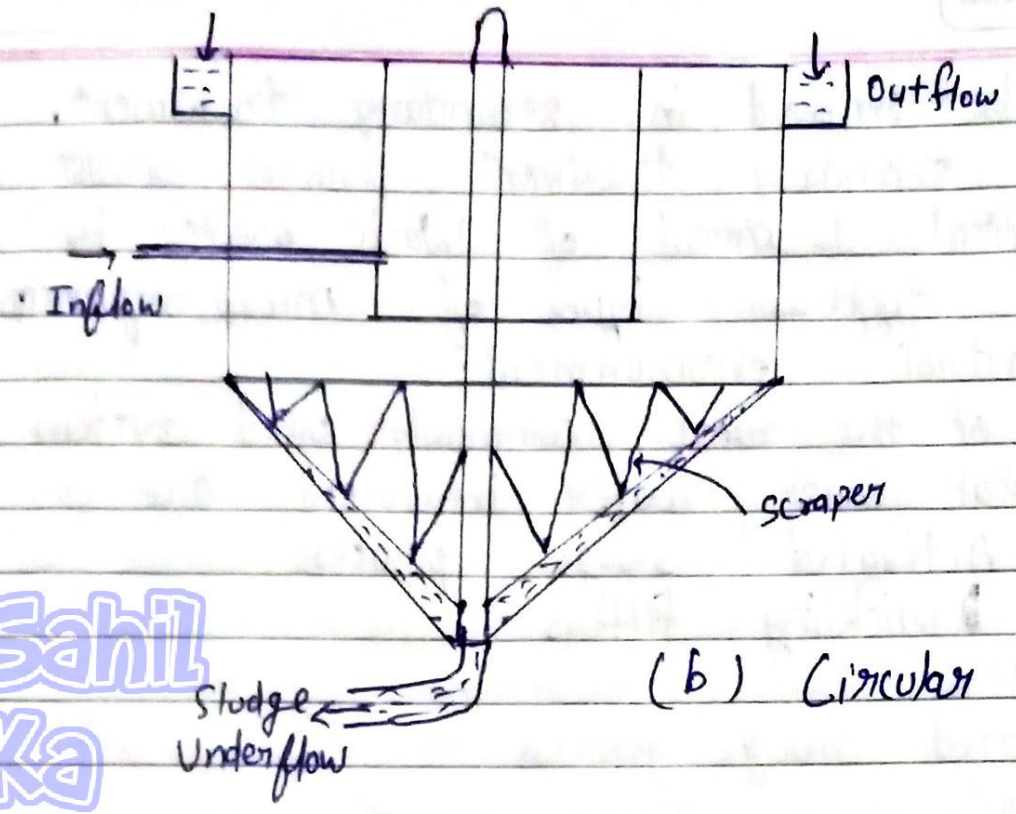
(vii) The solid that remains in suspention will be treated in secondary treatment process.

(viii) Principle primary treatment devices are sedimentation tank, primary tank, primary settling tank.

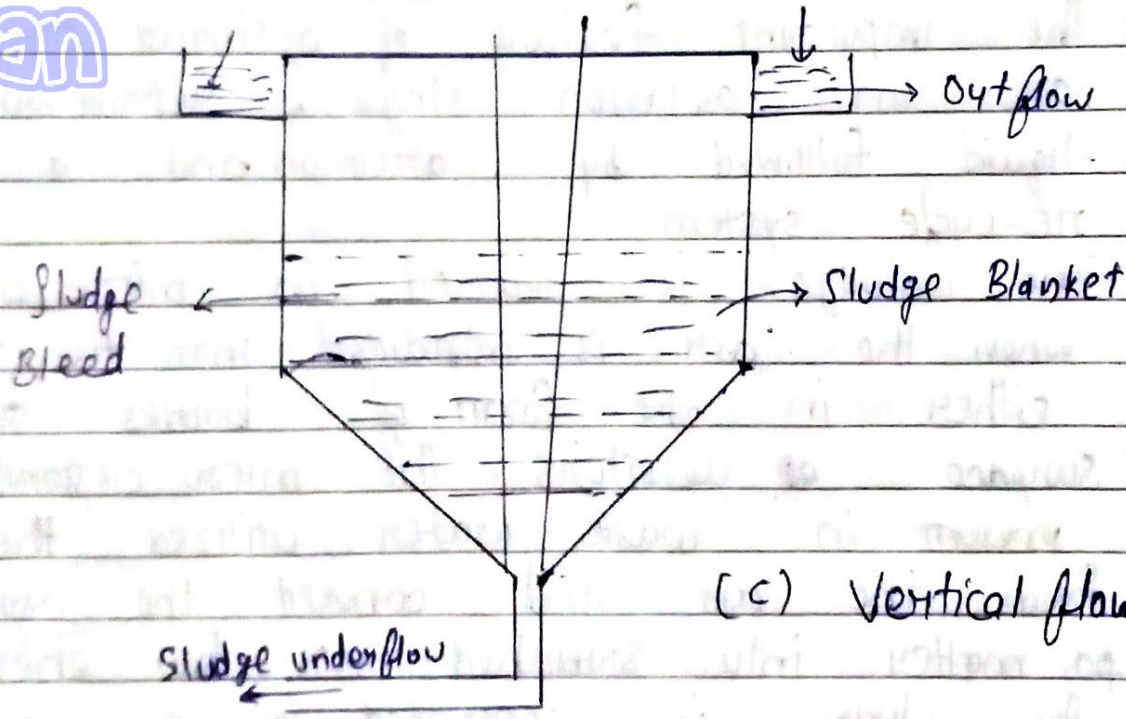
(ix) The sedimentation operation in waste treatment application may be carried out in rectangal horizontal flow, circular radia flow, vertical flow.



(a) Rectangle Horizontal Flow



(b) Circular Radial flow



(c) Vertical flow

— Secondary or Biological Treatment →

(i) The function of primary treatment is to removed the suspended solids but they are not efficient to remove the partical which is dissolved in waste water. So these dissolved organic and inorganic solids

can be removed in secondary treatment.

(ii) The secondary treatment process consist of biological treatment of waste water by utilizing many different types of micro organism in a control environment.

(iii) To of the most commonly used system for biological waste water treatment are
(a) Activated sludge process
(b) Trickling filters

(a) Activated sludge process :—

→ The important feature of activated sludge process are an aeration stage, separation of solid -liquid followed by aeration and a sludge re-cycle system

→ The sludge is reached in micro organism when the air is introduced into the tank either in the form of bubbles or by surface aeratoirs. The micro organism present in waste water utilized the oxygen from the air and convert the organic matter into stablished or low energy compound.

→ The sludge is separated in a settaling tank some time called a secondary setaler or a calrifine.

→ In the settaling tank the separated sludge exist without contact with the organic matter and becomes activated. Then all the activated sludge is recycled.

(b) Trickling Filters :—

→ Also known as percolating filter.
→ Trickling filters are used full for waste which is generated from milk processing unit, paper mill and farma waste.
→ Trickling filter consists of ropebed (depth 1-3m). It also having enough opening to circulate air easily. The affient is sprinkal over the bed packing which is coated with a biological slime.
→ As the liquid trickles over the packing oxygen and dissolved organic matter diffused into the film. To be metabolised by micro organism.

④ Tertiary or Advanced treatment :—
Method :—

(i) Nitrogen removal (ii) Disinfection (or)

↓ Adding Bleachingpower

↓ Boiling

(iii) phasphorous removal

Disposal of waste water:—

(i) Surface disposal (ii) Subsurface disposal
(iii) Disposal by Dilution

Reuse of waste water:—

(i) Water reuse in industry
(ii) Water reuse in Home
(iii) " " for irrigation purpose
(iv) Water reuse in fire protection
(v) " " in construction.
(vi) " " in environmetal enhancement
(vii) • Ground water recharge
(viii) cooling system process etc.

Rain Water Harvesting:— A rain water harvesting is the accumulation and storage of rain water for re-use, When the water table is below the expectable limit.

Necessary → (i) Increase the water table by recharging ground water.
(ii) Reduce ground water contamination for salt water.
(iii) To meet increasing demand of water.

Methods of RWH →

(i) Storage of rain water on surface for future use.
(ii) Recharge to ground water.

Components of RWH ⇒

Principle components are

(i) Catchment area
(ii) Collection device (iii) conveyance system

(i) Catchment Area :—
(A) Rooftop catchment
(B) Land surface catchment
(C) Increasing slope (ground improvement techniques)
(D) Soil compaction by physical means
(E) Soil compaction by chemical treatment

(A) Rooftop catchment ⇒ In this method of RWH the Roof of the house is act like a catchment area which is directly contacted with rain.

→ The amount and quality of rain water collected depends on the area and type of roofing material.

→ The pure rain water can be collected from roof constructed with aluminium and asbestos, steel, tile, galvanised iron sheets etc.

→ Roof catchment should be clean regularly to remove dust.

(B) Land surface catchment :—

→ RWH using ground or land surface catchment area is less complex with of collecting rain water.

→ Generally in this type of catchment area a natural run is required.

→ The appropriate slope can be provided to make artificial run of system.

→ It is useful to collect water for a larger area.

→ This technic is suitable for storing water for agriculture purpose.

(c) Increasing Slope :—

→ ~~Stpper~~ Steeper slope can be allowed rapid run of rain fall to the collector. It is also helpful for minimise soil erosion from the catchment field.

(ii) Collection Device ⇒

(i) Storage tank

(ii) Rain Fall water container

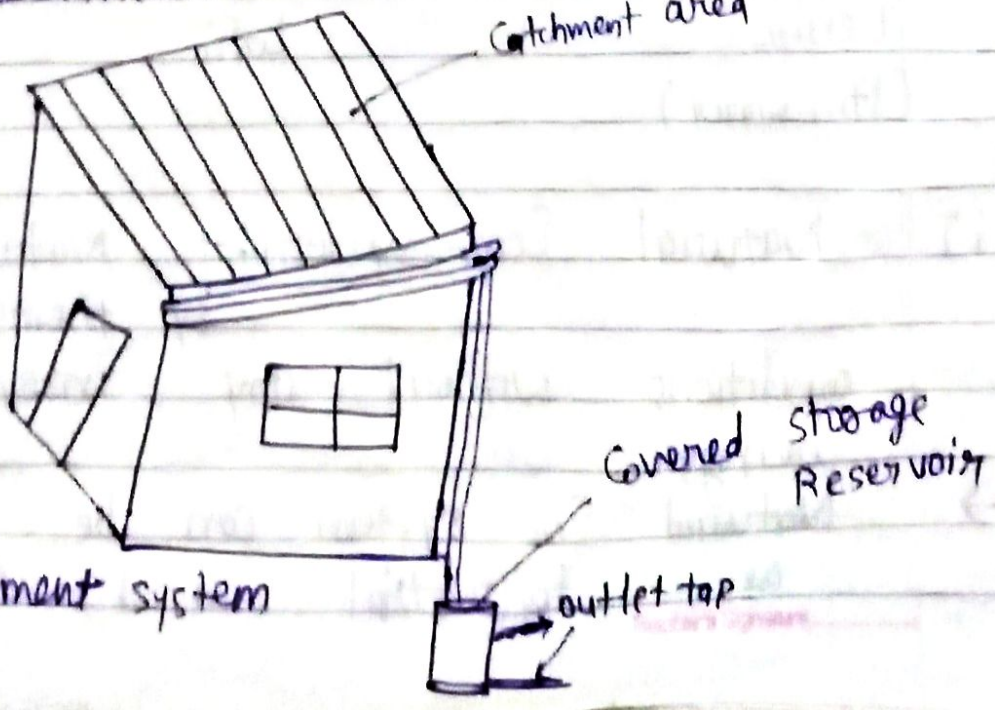
(1) Storage tank :— Storage tank for collecting rain water a harvested using guttering may be either above or below the ground. Precautions required in use of storage tank include provisions of minimise contamination from human, animal or other environmental contaminates.

→ A tight cover is required to prevent algae growth and breeding of mosquitoes.

(ii) Rain Fall water container :—

→ As an alternative to storage tank rainfall water container can be used having the large storage capacity around 1000 to 2000 l.
→ It can be easily clean and having many opening so that it can be easily ~~filled~~ with connecting pipe.

(iii) Conveynace System ⟹ These systems are required to transfer the rain water collected on the roof talks to the storage tank.
→ This is usually a complesed by making connection to one or more pipe connected to the roof ~~tops~~ gutters.
→ The pipes used for collection of rain water are generally made of plastic, PVC and other inner substances.



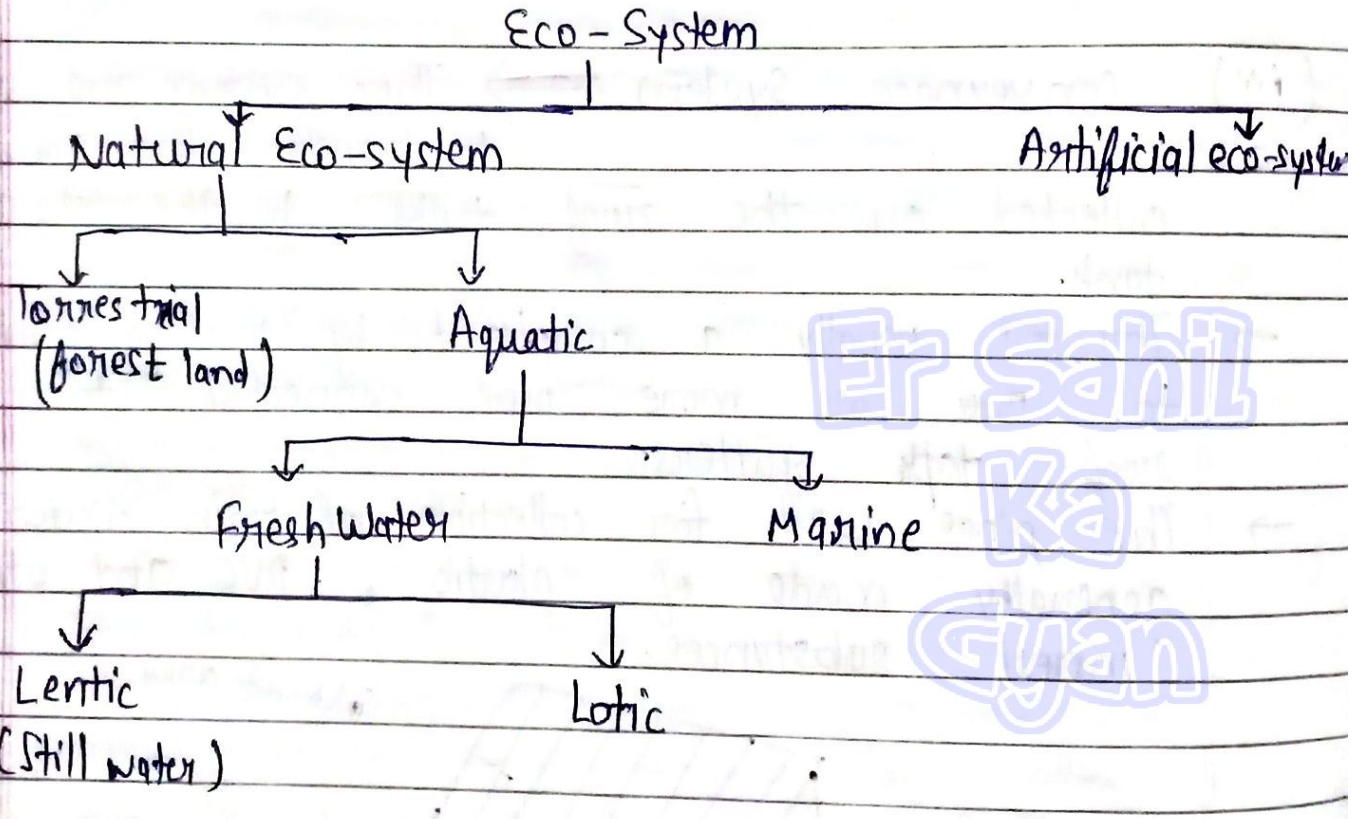
Roof top Catchment system

Imp

Eco-system ⇒ The term 'eco-system' means inter relationship of leaving organism with environment.

→ It can be properly defined as a structural and functional unit of bio-sphere which consists of a community of leaving organism interacting with surrounding environment for satisfing the base need of life.

Tyes of eco-system :—



(i) Natural Eco-system :— Natural Eco system operate by themself under natural conditions without any interference by human beings.

→ Natural Eco system can be classified further as terrestrial and Aquatic eco-system

(ii) Artificial Eco-system :- They are maintain artificially by human beings and such type of eco-system having less complexity and low genetic dianosity.

Components of Eco-system ⇒

(i) Biotic components
(ii) ABiotic components

(i) Biotic :- Biotic components describe a living component of an eco-system.
For ex - Organism such as plants, animals and all living things are biotic components.

→ On the bases of their nutritional behaviour these organism can be classified into 3 catageories
(i) Producer (ii) Consumer (iii) De-composar

(ii) Abiotic components :- Its are non living chemical and physical factor in the environment with affect the ability of organism to survive and reproduces.

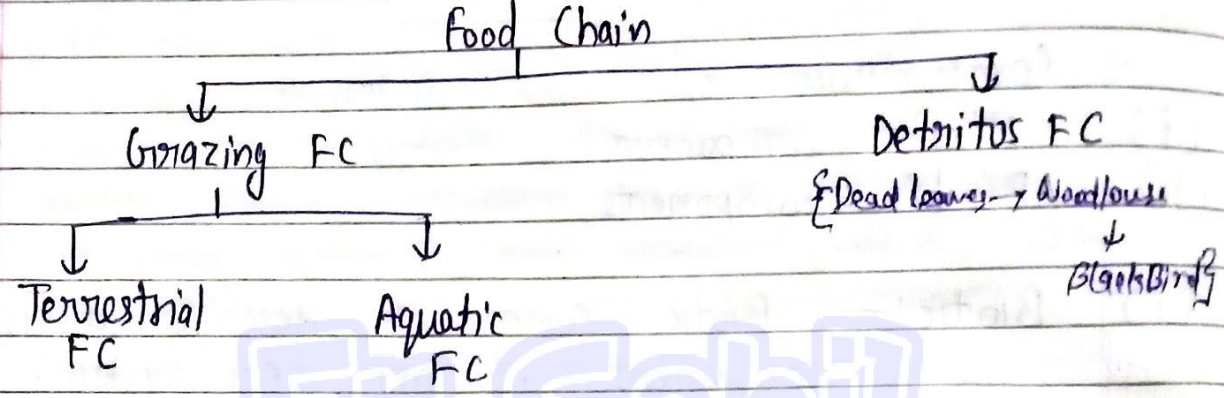
Types of abiotic :-
(A) Climatic factor (temp, light)
(B) Edaphic factor (soil, pH)

⁂ Function of Eco-system ⇒
(i) Food Chain and Food web :-

Transfer of

Detritus

food energy from producer to various consumer in a definate pattern is termed as food chain.



(i) Grazing Food Chain ⇒ This food chain involve producers and herbivores (शाकाहारी) and carnivores.

eg-

Producer → Grass hopper → shrew → Hawk

phytoplankton (पादप प्लवक) → Zooplankton → Small fish → large fish → Shark

Terrestrial F.C.

Aquatic F.C.

(ii) Detritus FC ⇒ This food chain starts from dead organic matter and then goes on to decomposing micro organism and other organisms

Dead leaves → Woodlouse → Black Bird

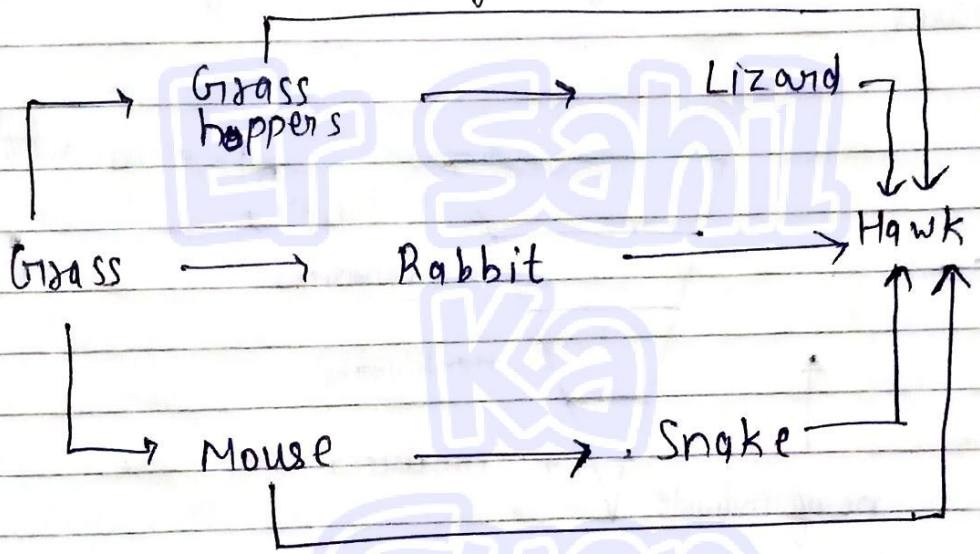
(2)

(i)
(ii)
(iii)

Food Web :—

In nature food chains are interconnected with each other and they can not be isolated. Interconnected food chain at various points forming a no. of feeding connections b/w different organisms are known as food web.

Food web in grass lane eco system.

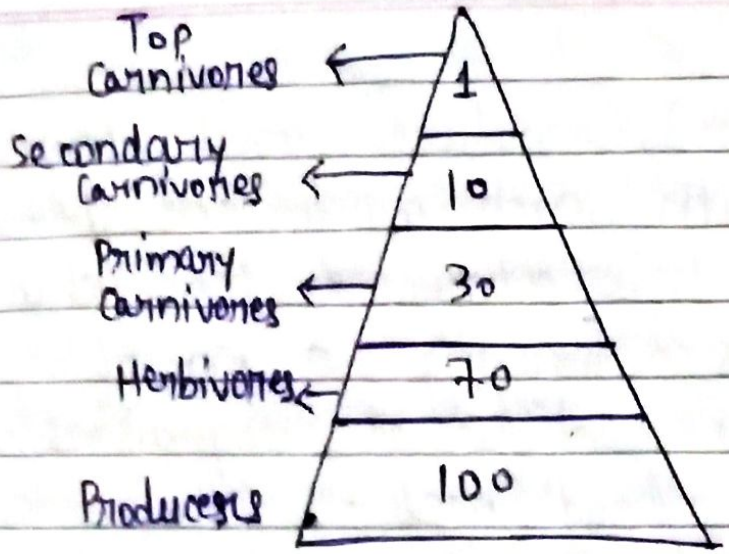


(2) Ecological ~~pyradi~~ pyramid ⇒ A rational study of various tropic level in an ecosystem is termed as 'ecological pyramid'.

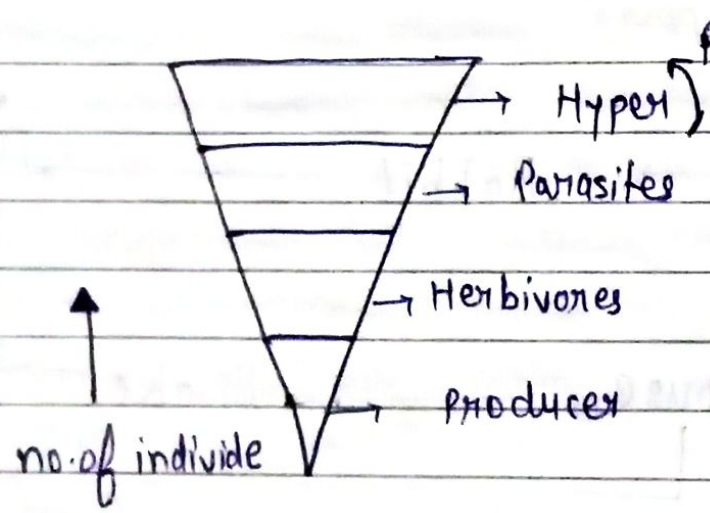
→ Ecological pyramids are of 3 type :—

(i) Pyramid of No.
(ii) Pyramid of Bio-mass
(iii) Pyramid of energy

Pyramid of Number —
- → Upright pyramid
- → Inverted
- → Spindle shaped



In this pyramid generally no. of individuals decreases.

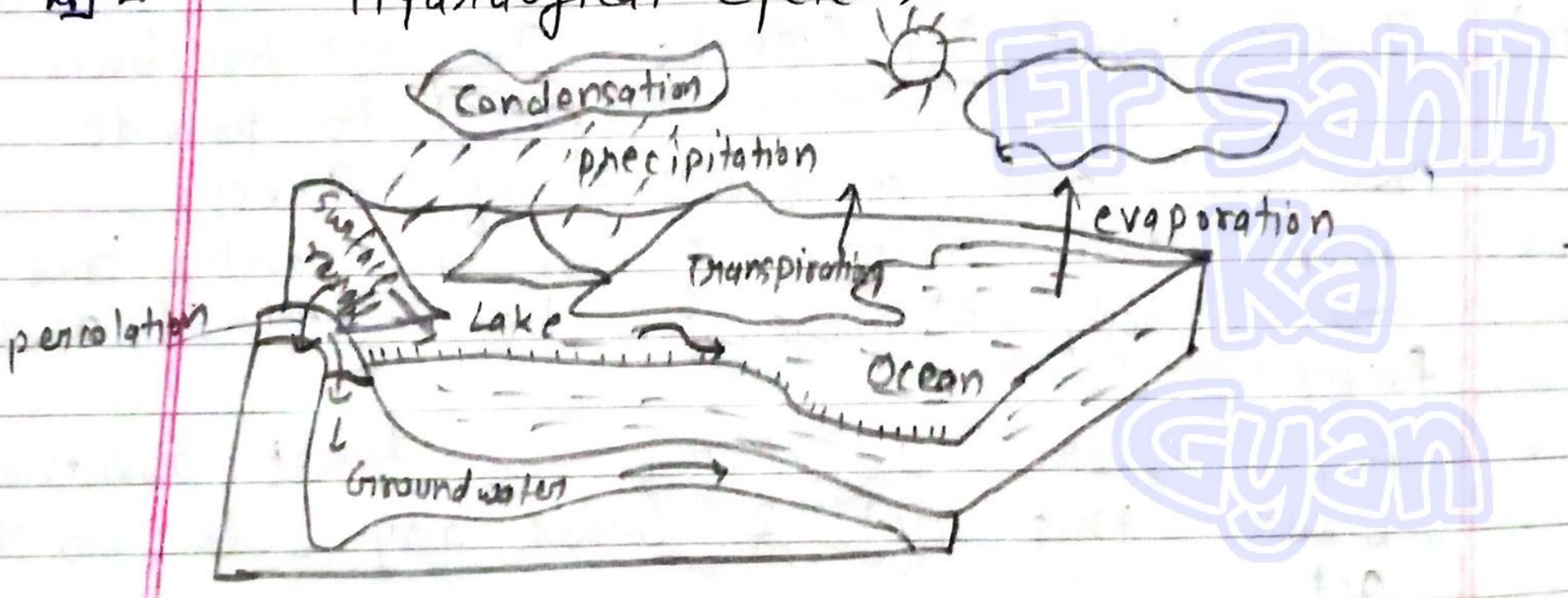


(3) Energy Flow :- A flow of energy b/w tropic level is an essential requirement for survival of an eco-system.

→ In an eco-system producers or green plants consume solar energy and convert into organic food or chemical energy such as carbohydrade through the photo synthesis system with the help of carbon di oxide & water in presence of chlorofil. Then its energy transfer into next tropic level with gradual lose.

Q.2 Draw the sketch of hydrological cycle & Phosphorus cycle & also explain the process of recycling.

Ans - Hydrdogical cycle ⇒



Water is an essential component for all the living organism. Hydrological cycle is a

cyclic exchange of water from one state to another. The water cycle begin with the evaporation which requires energy and the water cycle consists of following process:—

(i) Evaporation ⇒ It is the conversion of natural liquids like water into a gaseous form like air.

(ii) Transpiration ⇒ It is the evaporation taking place from any plant or greenery.

(iii) Condensation ⇒ It is the conversion of vapour to a liquid.

(iv) Precipitation ⇒ It is the fall of moisture from the atmosphere to the earth's surface in any form.

Phosphorous cycle:—

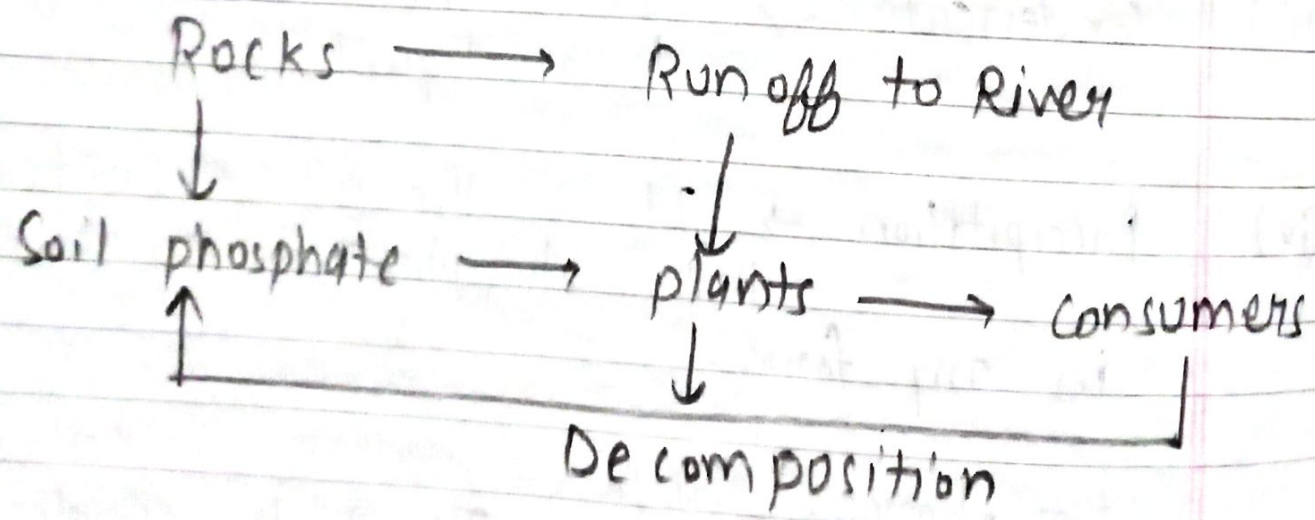
It is the simplest nutrient cycle among all the major cycles. Phosphorous is found in the soil and rocks as calcium phosphate [$Ca_3(PO_4)_2$] and calcium hydroxy phosphate [$Ca_5(PO_4)_3OH$]

→ Human activities also increase the phosphorous amount in the water by industrial waste and agriculture fertilizer waste.

→ Phosphorous containing rocks are broken down by chemical reactions & weathering action of wind.

→ Some of phosphorous is dissolved in water and some part of phosphorous is emerged into the soil.

→ plant & becteria obtain the phosphorous from the water & soil and convert it into the insoluble organic form, when the animals & human being feed such type of plants, this phosphorus enter into their body and decomposition of these plants and organism release the phosphorus in water or soil for re-use.



(2) Carbon cycle :—

(A) Carbon is the basic element for all organic metal & there are three main sources of carbon :—

(i) CO_2 in air & water

(ii) Different rocks containing carbohydrates

(iii) Fossil fuels like coal, petrol etc.

Process of carbon cycle :—

(i) CO_2 is coverted into the organic matter like carbohydrates by the photosynthesis and then transfer to the producer or plants.

(ii) From producer it goes to the consumer with the help of food chain.

(iii) The another important process is chemical combinatio by which carbon is coverted into the

coal, oil etc.

(iv) Now this CO_2 is again released in the atmosphere by three different processes which complete the carbon cycle.

(v) The first process is respiration of consumer in which the release the CO_2 into the atmosphere.

(vi) The second process is decomposition. After the dead of consumers, they are decomposed by microorganism and converted into the atmospheric CO_2.

(vii) The third process include the combustion of fuels by which CO_2 is released into the atmosphere.

Solid - waste Management :—

(i) Classification of solid waste =>

Solid waste are classified on the basis of source of generation. They are :—

(i) Domestic waste (ii) Industrial wastes
(iii) Construction & demolition waste
(iv) Agricultural waste
(v) Institutional waste (vi) Medical waste

(i) Domestic waste :— This category of waste includes all the organic & inorganic wastes from the residential
→ The organic components of these wastes mainly include food wastes, paper & textite wastes, plastic & leather wastes.
→ The inorganic components include glass, bottles, tin, can, oil & paint.

(ii) Industrial waste :— Solid waste generated from the various processes in small & large scale industries are classified as industrial wastes.
Both hazardous & non-hazardous compounds are found in industrial waste.

(iii) Construction & demolition (ध्वंस) waste :— In this type of waste bricks, concrete, stone, timber, electric parts, cement leags are included.
These wastes are generated from the construction work, repairing works and demolition work.

(iv) Agricultural wastes - Wastes generated from agricultural activities like planting and harvesting of trees, poultry farms, animal farms are included on the agricultural wastes.

(v) Institutional wastes :- It includes the wastes from the schools, colleges, government offices. This category of waste is generally similar to the residential & commercial wastes. But the preparation of paper, card-board and packaging of materials is much higher in this type of waste.

(vi) Medical wastes :- This waste is generated from the hospitals, nursing homes and it also infections materials such as discarded dressing materials bendages. This type of waste requires a special arrangement for disposal.

(ii) Collection & transportation of solid-waste :-

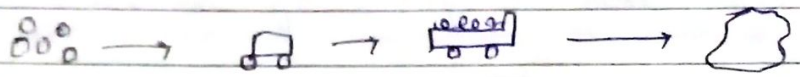
Collection of Solid waste :-

(A) Community storage point ⇒ In this method the municipal waste is taken to the fixed storage beings and store till the waste collection agency collect it daily for disposal in collection vehicle.

(B) Kerb site collection :— In the kerb site collection the waste is brought in the containers which is placed on the foot way. From where it is collected by waste collection agency. (ii)

(C) Block collection :— In the block collection system, individual house-hold bring the waste in container and handover it to the collection staff who empty the container in the vehicle & return the container individual.

Transportation of SOLID WASTE ⇒ (iii)



(iii) Disposal method of SOLID WASTE :— (iv)

(i) Land fill :- It is the most common method which [Leaching affect] is used for the disposal of solid waste. In this method a deep trench is excavated below the group surface & the collected solid waste is filled into the trench. After the complete filling of trench, it is covered with the layer of soil. (v)

→ liquid contamination {Leaching affect}

(ii) Sanitary Land filling :-
It is also known as secure land filling. In the Sanitary land fill the percolation of water in the soil is protected with the layer of impervious material.
In the sanitary land filling again a deep trench is excavated and the solid waste is led into the different layer. Each layer is separated by impervious layer of material so that the contaminated waste will not percolate into the deep layer of soil.

(iii) Incineration Process :- It is a Waste disposal method that involve the burning of waste at a high temp. In the incineration method waste is burned in the presence of oxygen but this method is not ideal method because it is not an environmental frienkly method.

(iv) Composting :- It is the process in which organic waste such as plant materials, food waste, paper product are composted at a temp. of around 70°c. After the composting of organic method it can be used at a fertilizer for agriculture purpose.

(v) Pyrolysis :- In this method the solid waste is heated with the limited oxygen which is available in a sealed place. This method is also known as waste to energy method because the burning of the waste material convert the waste into the heat in the form of gas by which we can produce

electricity.

(vi) Open dumping :—

On site sanitation :- On site sanitation is the action related to the treatment and disposal of domestic waste water that can not be carried away by an of sites sanitation system because of low density of population.

→ For small communities in rural or semi urban areas or even in most of the towns of india where proper sewage system is still are dream.

→ The conventional off site excreta disposal system followed by a sewage treatment & disposal plant is generally not affordable in this areas.

GLOBAL WARMING ⇒

→ Global warming is termed to be the increase in the average temperature of earth.

→ The global warming is a specific example of climatic changes which influens life on the earth.

→ According to IPCC {inter governmental pannel on climate change}, the IPCC concludes that the most of the temp. increases since

the middle of 20th century and it was cause by increasing concentrate of green house gases resulting from the human activities such as de-forestration.

→ It also conclude that variation in natural finoming such as solar radiation & volcanic activities produces most of the warming.

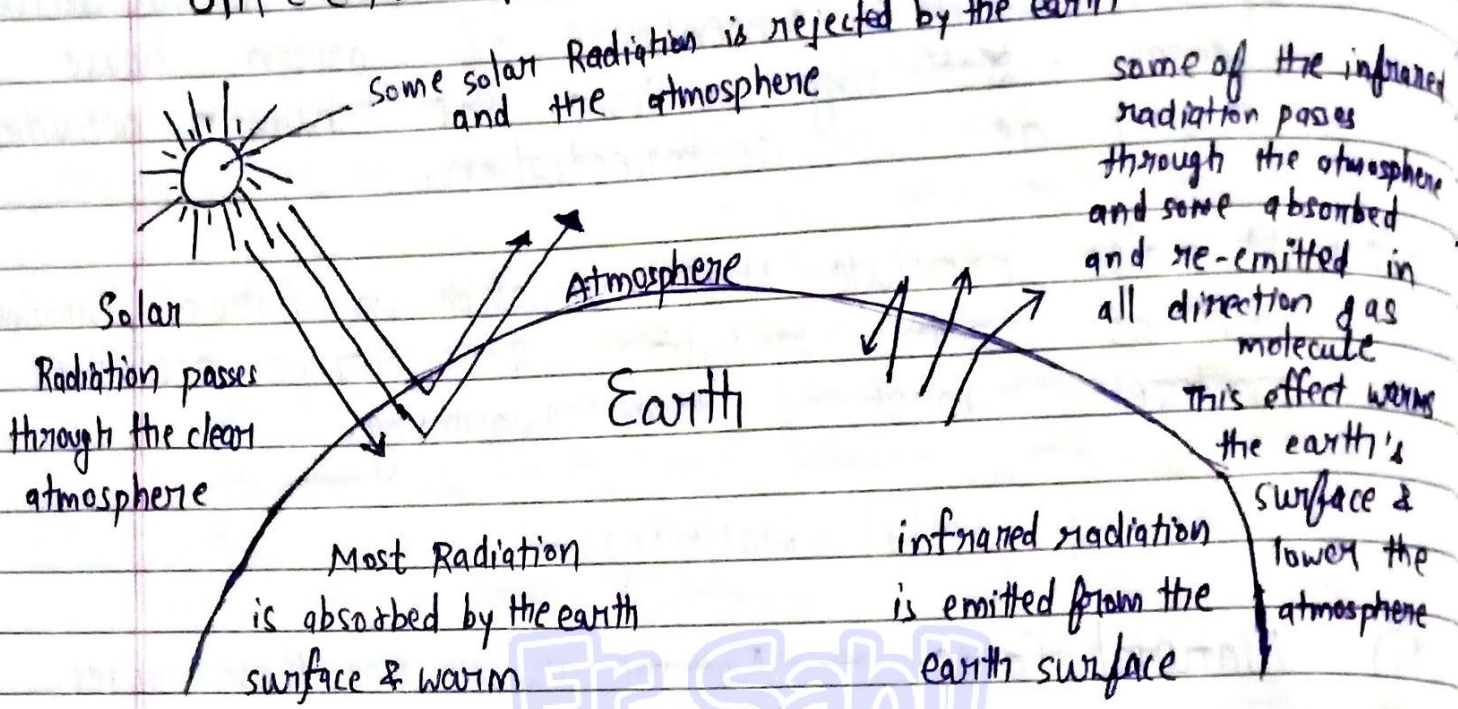
Cause of global warming :—

(i) Natural Cause :— Natural causes are those causes which are created by nature such as release of methane gas from the wet land and methane gas is green house gas which is very dangerous to the environment. Other natural cause is the cycle of climate change.

(ii) Man made cause :— Pollution is the one of the biggest men made problem. Burning of fuels, use of automobiles, industrialisation are the one of the major factor of pollution and global warming

→ Fuels are made of organic matter such as coal or oil. When fuels are burned they produce a green house gases such as carbondioxide, methane, CFC etc. which is responsible for global warming.

GREEN HOUSE EFFECT ⇒



When sunlight reaches the earth surface, some part of it is absorbed and warms the earth and rest of the radiation by to the atmosphere. At a longer wavelength than the sunlight. Some of these ~~layer~~ longer wavelength are absorbed by green house ~~effect~~ gases in the atmosphere before they are lost to space. The absorption of this long wavelength radient energy warm the atmosphere and hence the temp. of earth increases continuously. The reflecting back of heat energy by ~~th~~ atmosphere is called green house effect.

→ The major natural greehouse gases are water vapour, CO_2, CH_4, and oxygen (O_3). Other greenhouse gases are N_2O, HFCs, sulphur hexafloride and chlorn flouro carbon.

→ The higher the concentration of greenhouse gases like carbondi oxide in the atmosphere the more heat energy is being reflected back to the earth.

Air Pollution ⇒

Source of air pollution ⇒

(i) Man made source :—

→ Stationary sources such as stacks of power plant or factories, waste insinerators as well as furnaces and other fuel burning heating devices.
→ Mobile sources such as aircraft, motor vehicles, affect of sound etc.
→ Waste deposition in land fill which generate methane.
→ Toxic gases, nuclear weapon, Rocatary etc.

(ii) Natural sources :—

→ Dust from natural sources
→ Radon gas from radioactive decay with the earth crust.
→ Methane gas emitted by food digestion by animal.
→ Smoke & carbon monooxide from natural source
→ Volcanic activities.

Types of Air polluted :—

(i) According to origin ⟹

(A) Primary polluted :—

Those substances which are directly emitted into the atmosphere and do not change into any other form.

eg - oxide of sulphur, nitrogen, carbon, hydro carbon, dust, flyash etc.

(B) Secondary polluted :—

It is formed in the atmosphere by the interreaction of primary pollutents and environment.

eg - Photochemical smoke, ozone and PAN.

(ii) According to state of matter :—

(A) Natural pollutents :— eg - natural fog, pollen grains, bacteria and products of volcanic eruption.

(B) Particulate pollutent :— dust, smoke, fog & fumes.

(C) Gases pollutent :— Silphur compound, oxygen compound, nitrogen compound, halogen compound, radioactive gases & hydro carbon etc.

HARMFUL AFFECT OF AIR POLLUTION :—

(1) AFFECT ON HUMAN HEALTH :—

Air pollution have many affect on human health. High concentration of sulphur di oxide affects the lungs, lead polluted results in brain damage.

→ Mercury is responsible for kidney damage & burth defect.

→ Carbon mono oxide reduces the oxygen carring capacity.

→ Photo chemical oxident like - smoke, irritation to eyes.

(2.) AFFECT ON PLANT :—

→ High concentration of SO_2 affect the chlorosis of leaves.

→ Ozone gas is known to damage of plant, which collaps the leaf and nurosis and bleaching affect.

→ NO_2 decrease the growth of plant.

→ Floride also affect the ncrosis of plant.

(3.) AFFECT ON ANIMAL :—

→ Subsequent of poisioning of the animal when they heat the contaminated vegetation.

→ Lead poisioning results in the lack of appetite in the animals.

NOISE POLLUTION :—

Sources of noise pollution :—

(i) Traffic including air traffic, road traffic etc.
(ii) Industries include all kind of industries which generate noise
(iii) other activites like loudspeakers, horns, ringing of bell etc.

Noise control :—

(i) Control at source only ⇒
For example improved version of engine of automobiles and aircraft which release less noise.
→ By legal laws and ordinances and acts.
→ By proper town planning technic such as ~~joining~~ zoneing etc.

Source of dangerous level sound :—

Source	DB
(i) Produces pain	120 – 140 dB
(ii) Jet aircraft during take off	130 dB
(iii) Tractor without cab	120 dB
(iv) Rock concert	110 dB
(v) Drilling Machine/ Drillers	105 dB

Source - Discomfort level	dB
Heavy Traffic	Above ~~80dB~~
Automobiles	70dB
vacuum cleaner	65 dB
Conversational speech (at 1 metre)	60 dB
Business office	50dB

Explain any two environmental pollutions with their causes, effects & controlling method.

(i) Thermal Pollution ⇒

Thermal pollution is defined as a sudden increase or decrease in temp. of a natural body of water which may be ocean,

lake, river or pond.

Causes:-

(i) Water as a Cooling agent in power, manufacturing and industrial plants.
(ii) Deforestation of shoreline.
(iii) Soil erosion

Effect:-

(i) Elevated temperature decreases the level of dissolved oxygen in the water.
(ii) Loss of Biodiversity.
(iii) Affects Reproductive Systems of aquatic life.
(iv) Increases Metabolic rate in organisms.

Control:-

(i) Instead of discharging heated water into lakes & steams, power plants and factories can pass the heated water through cooling towers.
(ii) Waste hot water can be used for heating homes or other buildings located near industrial plants.

(iii) Radioactive Pollution: ⟹

Radioactive pollution is defined as the increase in the natural radiation levels of air, water or land caused by human activities.

Causes:—

(i) Production of nuclear fuel
(ii) Nuclear power reactors
(iii) Use of Radionuclides in industries.
(iv) Nuclear tests
(v) Disposal of nuclear waste
(vi) Uranium Mining
(vii) Medical X-Ray Machines
(viii) Micro wave oven.

Effects:—

(i) The radiations destroy the cells in the human body.
(ii) Thyroid tumors, skin cancers, nausea
(iii) Lung cancer
(iv) Nuclear radiation can contaminate soil.

Control:—

(i) Safety measures should be enforced strictly.
(ii) leakages from nuclear reactors, careless handling have to be totally stopped.
(iii) There should be regular monitoring and quantitative analysis through frequent sampling in the risk areas.

Ozone Layer Depletion :—

→ The ozone layer is responsible for absorbing harmful ultra-violet rays and preventing them from entering the earth's atmosphere. But the various factors have led to the depletion and damage of this protective layer.

→ UV rays are high energy electromagnetic waves which is emitted from the sun. A huge amount of radiation adversally affect the nature, earth's atmosphere & human being.

→ One of the major substances which is responsible for ozone layer depletions are hydro-chloro-carbons and volatile organic compounds. These are generally found in vehicle emissions, by product of industrial process, refrigerants etc.

→ Ozone is a triatomic form of oxygen which is found in the earth's atmosphere. A combination of low temp., elevated

chlorine & Bromine concentration in the upper stratosphere are responsible for the distraction of ozone.

→ The CFC is the leading cause of ozone layer depletion and It is assumed that almost 80% of total depletion of ozone is by CFC.

Impact on Human

(i) Skin cancers
(ii) Eye damage
(iii) immune system damage.
(iv) accelarated aging
(v) Other affect such as breathing problem, throat irrigation, chest pain etc.