

CBCS SCHEME

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18CV36

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Engineering Geology

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Discuss in brief different branches of Geology, which are related to Civil Engineering. (04 Marks)
 b. Briefly explain the internal structure of the earth based on different unconformities and add a note on its composition. (08 Marks)
 c. Explain the role of Geology in the field of Civil Engineering. (08 Marks)

OR

- 2 a. What is Mineral? Describe the following Physical properties of a Mineral. (06 Marks)
 i) FORM ii) Hardness iii) Fracture
 b. Explain the primary structures in Sedimentary rocks, with neat sketches. (08 Marks)
 c. Write a note on Soil profile. (06 Marks)

Module-2

- 3 a. What are Folds? How are they caused? Discuss the various types of folds in rock and influences on Civil Engineering. (15 Marks)
 b. What is Normal Fault? Add a note on Horst and Graben, with neat sketches. (05 Marks)

OR

- 4 a. What is Weathering? Describe Physical and Mechanical weathering. (10 Marks)
 b. Explain Railway ballast with examples. (05 Marks)
 c. Write notes on causes of Landslides. (05 Marks)

Module-3

- 5 a. What is an Out Crop? Describe the terms strike and DIP, with a neat sketch. (08 Marks)
 b. Explain Floods, causes and its control. (06 Marks)
 c. Write a note on Tunneling through the fold axis of an Anticline. (06 Marks)

OR

- 6 a. Briefly explain Exogeneous and Endogeneous geological events. (06 Marks)
 b. Describe the different drainage patterns of a River basin, with neat sketches. (08 Marks)
 c. Briefly explain Extrusive and Intrusive forms of Igneous rocks. (06 Marks)

Module-4

- 7 a. Explain the Electrical resistivity method for exploration of ground water. (08 Marks)
 b. Explain how the quality of ground water can be determined by SAR, RSC, GTH. (04 Marks)
 c. Explain how Artificial recharge of ground water can be made. (08 Marks)

OR

- 8 a. Describe with a neat diagram, Vertical distribution of Ground water. (10 Marks)
 b. Write a brief note on Land forms. (10 Marks)

Module-5

- 9 a. What is an Earth Quake? Describe the Tectonic causes of Earthquake and its effects. (08 Marks)
b. Explain Aquifer and its types. (06 Marks)
c. Write a note on Specific Yield and Specific Retention. (06 Marks)

OR

- 10 a. What is Remote Sensing? Write its application in Civil Engineering. (08 Marks)
b. What is GIS? Name the different components of GIS. (06 Marks)
c. Write an application on Global Positioning System (GPS) in Civil Engineering. (06 Marks)

Go on

Subject: Engineering Geology 18CV36

Time: 3 hrs.

Scheme of Valuation

Max. Marks: 100

Note: Answer any Five full questions, choosing ONE full question from each module.

Module - I

1 a. Discuss in brief different branches of Geology, which are related to civil Engg.

(4 M)

Ans:-

* Construction Material Engineering :- Different types of Construction materials like Rocks & minerals are used for Building Purpose where Geology knowledge is essential to understand its basic concept.

(1)

* Geotechnical Engineering :- To understand Brief Pedology knowledge is essential to understand its basic of Soil in the Construction materials.

(1)

* Environmental Engineering :- To asses the availability of Water and Quality Assessment of water need to full fill the Soilent is essential to understand its basic of hydrogeology knowledge.

(1)

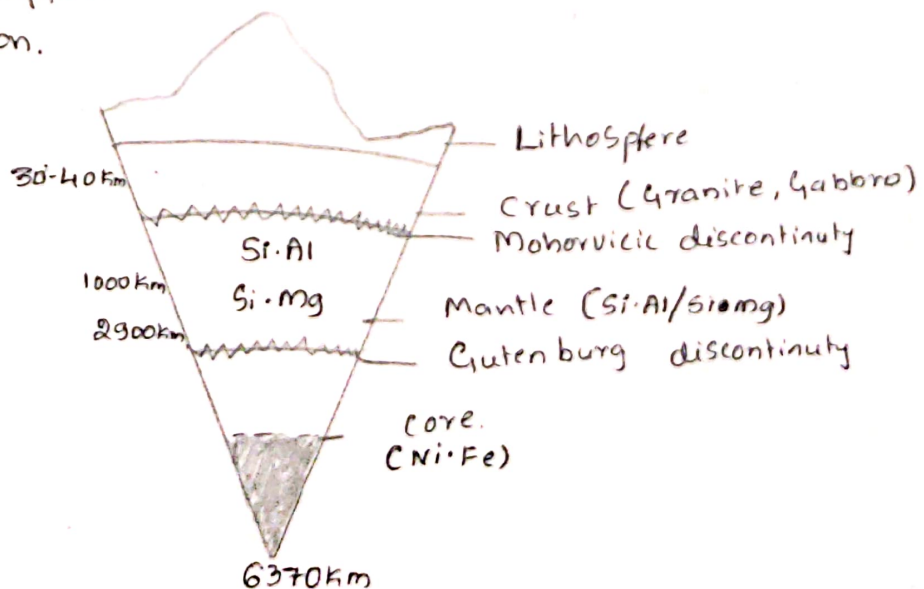
* Structural Geology :- To understand Earth Internal & External Structure of earth ~~to~~ Civil Engg need to have basic of Fold, Fault & Joint Structure knowledge.

(1)

(4 M)

1 b. Briefly Explain the internal Structure of the earth based on the different unconformities and add a note on its Composition.

Ans:-



Internal Structure of Earth & its composition.

Mohorovicic Discontinuity: The boundary which separates crust & mantle.

Gutenberg Discontinuity: The boundary which separates mantle & core.

Crust :-

The outer superficial layer below the soil layer called as lithosphere (Rock layer). Here the crust is made up of solid hard body (Rocks).

The crust again subdivided into three types.

- + Mountain crust
- + Continental crust
- + Oceanic crust

Here the mountainic crust and continental crust is made up of Granite rocks which has 2.6 to 2.7 specific gravity with high density and the oceanic crust is made up of Basalt rock (Basaltic Rock layer). The composition of continental and mountainic crust is silica and Alumina (Si & Al) and the composition of oceanic crust is silica & magnesia (Si & Mg)

Mantle :- it is located beneath the crust and has thickness of 2900 km and boundary between crust mantle is called Mohorovicic discontinuity. its density is 3.3 its composition is Ferromagnesium silicates. and it is in molten stage and the temp is 700 to 1300°C.

Core :- It is the inner most zone or layer starting from the base of the mantle. It has been referred by seismic waves that the earth's outer core is in dense liquid form and the density that the scientist believes more than 12.

C Explain role of Geology in the field of Civil Engg.

us:- Mapping:- The Engineering Geologist has to prepare a map of the area based on the aerial photograph & Satellites Images for the field observation.

Exploration:- In this case the stage of Engineering Geologist explore the area based on Exploration techniques.

Project planning:- It is important aspect in civil engg. the Civil Engineer plans the various structure for ex: Dams Canals, bridges etc. Before going to the project Engineering Geologist.

Surface water (Hydrology):- Geologist and Civil Engineer together has to prepare a water mapping to study Surface Water

Ground water (Hydrogeology):- It is the major problems is majority of civil engineering every engineering has to study the occurrence of water.

Slope Stability:- Geological parameters of possible slide region are to study.

Geological structure:- In a field investigation the selection of stable area has to study of surface or subsurface there structures are present.

Tunnelling:- Tunnel site selected based on a details of study region area to study folds, limbs, lithology, erosion area etc.

Earthquake:- The Engineering Geologist study the seismic nature of the project site. Area has to examine the earthquake zone.

OR

2a.

What is minerals? Describe the following physical properties of minerals.
Minerals:- It is a branch of geology which deals with the minerals along with their physical properties.

It is a naturally occurring inorganic substance which have definite chemical composition & regular atomic str.

i) Form:- Study of mineral shape which have various shape formed in the field.

ii) Hardness :- It is defined as the amount of resistance by the mineral for the external forces. It is determined by comparison with standard mineral scale.

"Mohr's Hardness Scale"

- | | |
|-------------|--------------|
| 1) Talc | 6) Feldspar |
| 2) Gypsum | 7) Quartz |
| 3) Calcite | 8) Topaz |
| 4) Fluorite | 9) Corundum |
| 5) Calcite | 10) Diamond. |

iii) Fracture :- No. of molecule bond by mineral atomic structure is called fracture.

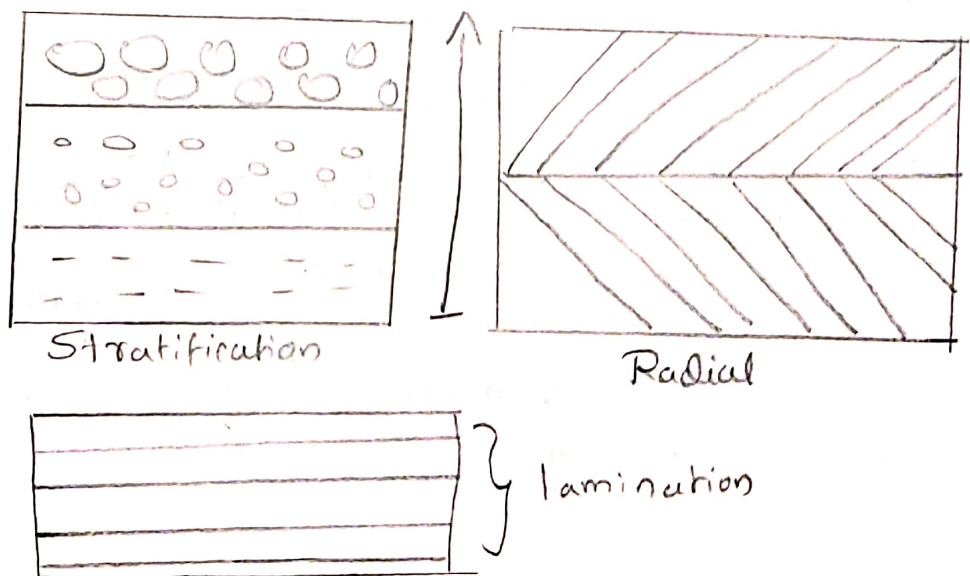
Q. b

Explain Primary Structures in ~~Sediments~~ Primary Sedimentary Rocks with neat sketch.

Ans:- These are described as Secondary rocks they derived from consolidation of sediments. The Sedimentary rocks include variety of rocks formed by accumulation, compaction and consolidation of sediments or even organic material.

Characteristics of Sedimentary Rock:-

- * Presence of certain structure like stratification or lamination,
- * Presence of cementation.
- * Presence of fossils.



Classification of Sedimentary rocks.

- 1) clastic
- 2) Non-clastic.

1) clastic (mechanical Process)

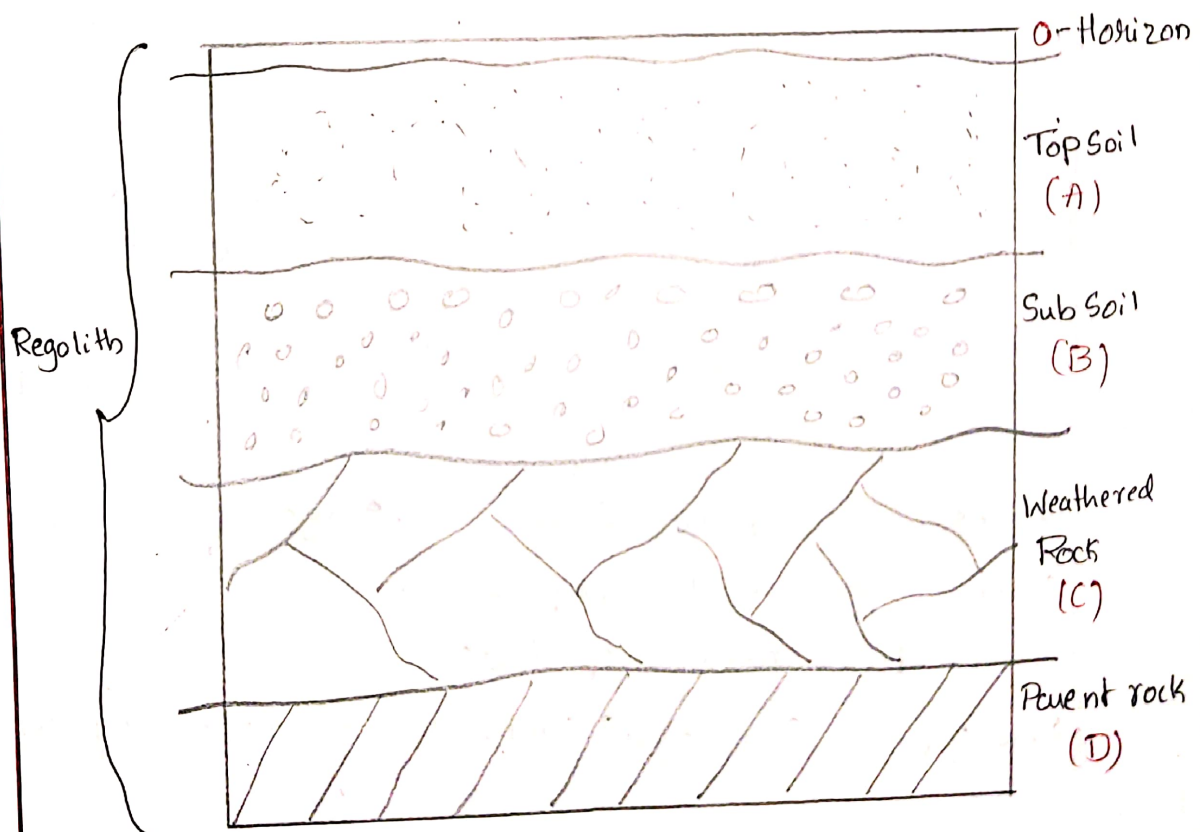
These group of rocks are most common in Sedimentary rocks. They are formed by a long process (Weathering, Transportation & deposition) of a material for
Example :- pebbles, gravels, sand and clay.

2) Non-clastic (chemical process)

Rocks of chemical origin are very small in presence they are formed by the direct materials of solution. Ex:- Carbonate deposit (CaCO_3), sulphate deposit.

Q.C.

Write a note on Soil profile.



Soil :- It is referred as loose rock material (disintegration of rocks) as regolith (layers of rocks) which lies above solid geology. It is naturally body consisting of layers (horizons) that are primarily composed of minerals mixed with at least some organic matter. Soil has the density of b/w $2g/cm^3$.

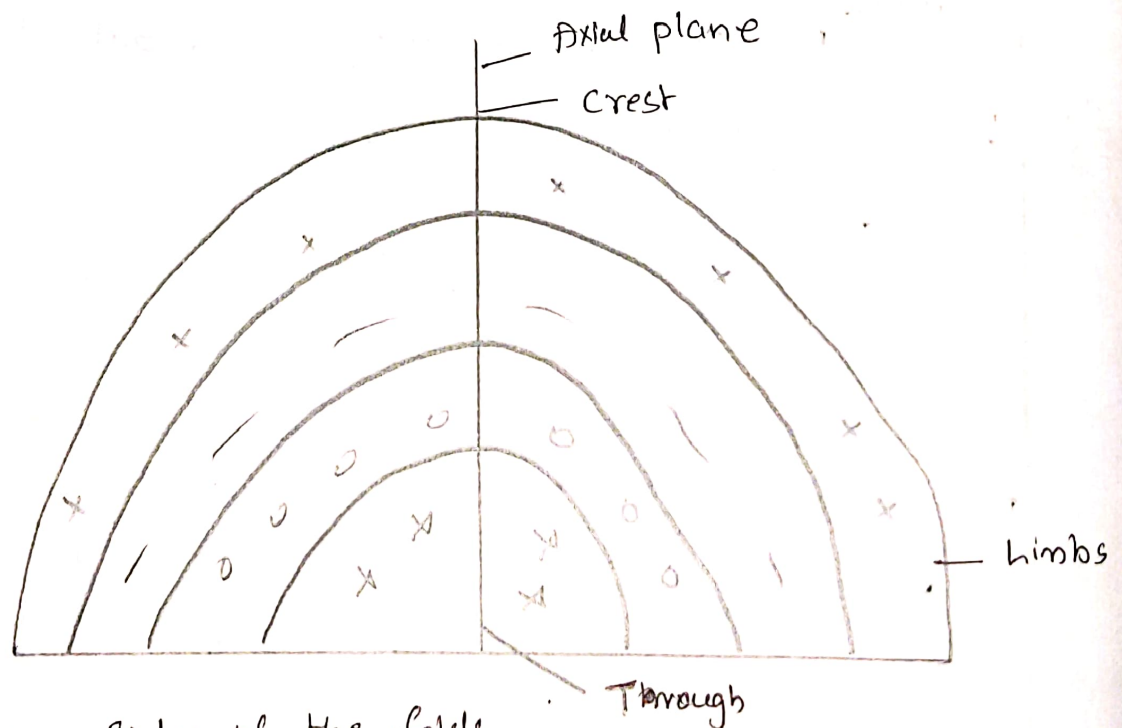
Module - 2

3a.

What are folds? How are they caused? Discuss the type of folds in rocks and influences on Civil Engg.

Ans :-

Folds may be defined as undulation or bending curvature developed in the rock strata.



Limbs :- Sides of the folds

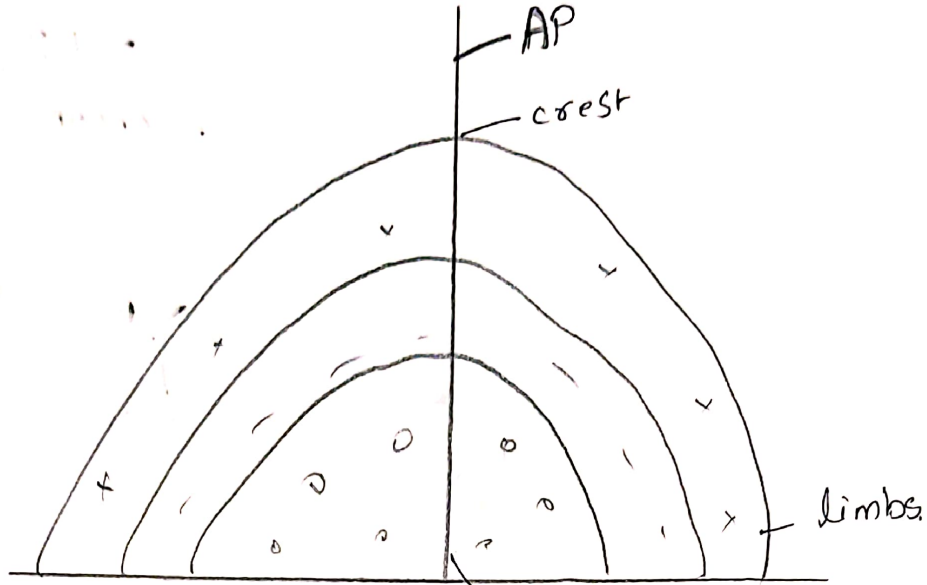
Crest :- upper undulation of folds.

Trough :- lower portion of folds.

Axial Plane :- Dividing 2 limbs at the centre of the fold

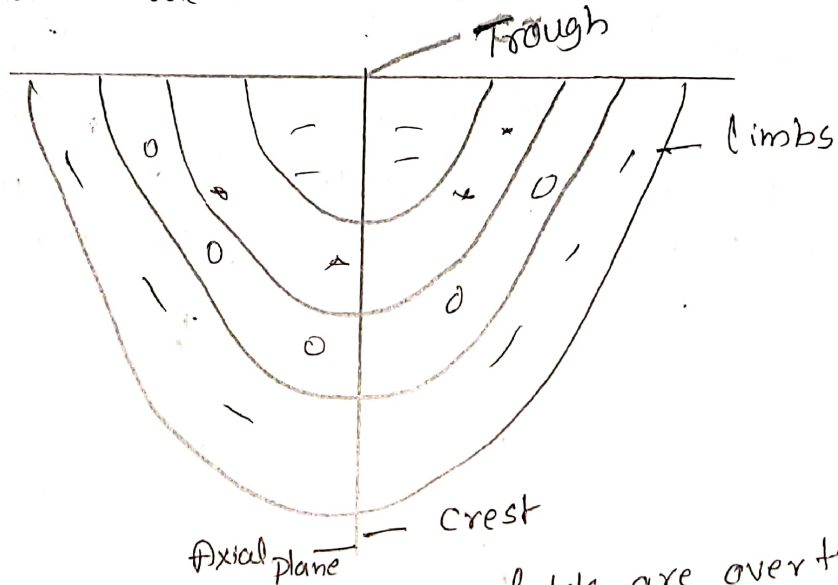
Types of folds (Geometrical Classification)

1) Anticline :- When folds are upfolded into arc like structure are called as Anticline.



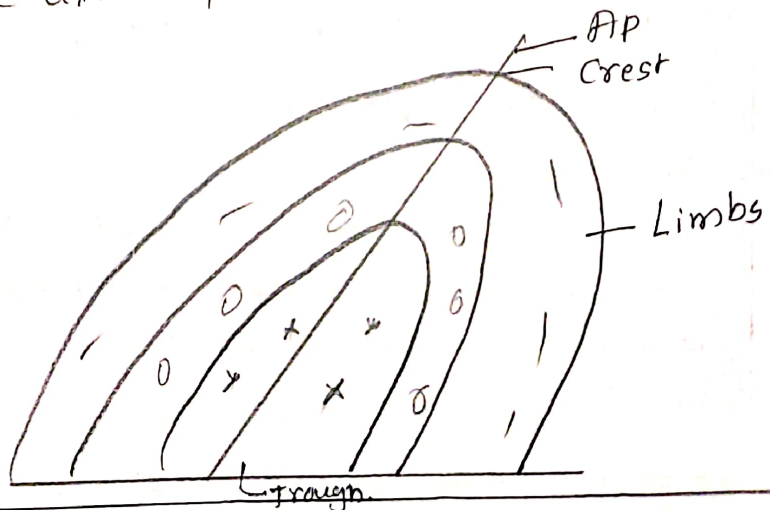
02

2) Syncline :- When beds are down folded into arc like structure are called as Syncline.



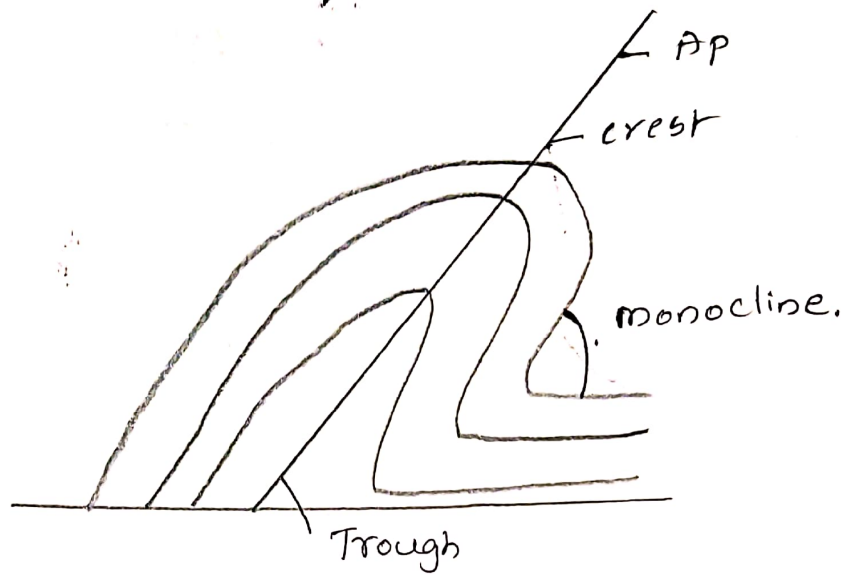
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3) Overturned :- In this case folds are overturned in which the axial plane is so much inclined.



02

4) Monocline fold:- This is the simple type of fold of single step like structure of fold can be observed.

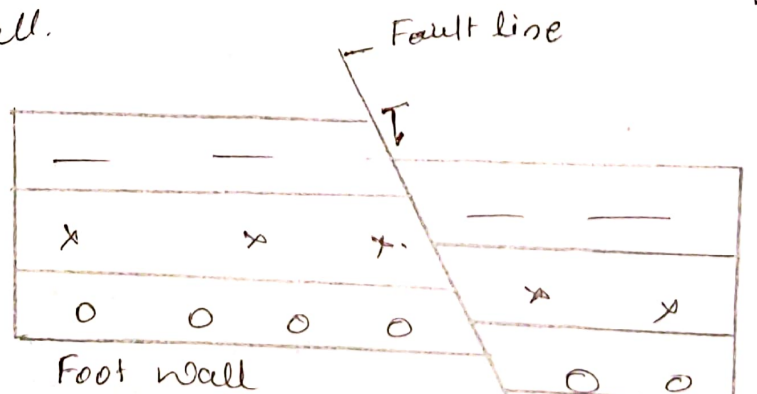


3 b)

What is normal fault? Add note on Horst & Grabben with neat sketch.

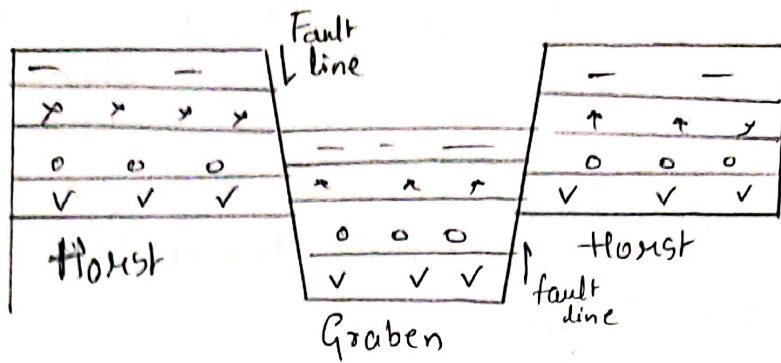
Ans:-

Normal fault is also known as Gravity fault. These are the faults on the earth's surface where the hanging wall has been moved down with respect to the foot wall.



Horst & Grabben:- The horst and Grabben is the combination of two normal faults occurring in one bed (Rock strata) so that their blocks are moved down with respect to the central block.

Horst is one in which wedge shape block has gone upward with respect to the side block. The Grabben faults are one in which wedge shape block has come down with respect to the side block.



49.

Ans

What is weathering? ^{or} Describe physical & mechanical weathering.

It is a natural process where the rocks of earth's crust which undergo disintegration or decomposition. This process takes place under the influence of natural agents like pressure, temperature, rainwater etc. due to this the rocks break ~~into~~ and undergo decay of the materials by the natural agencies are called as weathering.

Physical weathering :- It is also called as mechanical weathering. This weathering occurs when physical force breaks the rocks into smaller particles, size or pieces without changing its composition.

Physical weathering may be defined as 3 types.

- 1) frost weathering
- 2) Exfoliation.
- 3) spheroidal

1) Frost weathering :- It occurs when water is present in cracks of rocks. It tends to disintegrate because water is freezing it expands the rock volume and therefore it puts a great pressure on the rock walls of cracks (joints) by this process angular fragments of rocks are broken down.

2) Exfoliation: The effect of change of temp on the rocks is considered as change in a rock i.e different between day and night time the temp is varying. At day time the rocks more often hot and at night time rock will cool down. This repeated process tends to break the rocks into smaller particles.

3) Spheroidal weathering: - When weathering occurs some times part of the disintegrated rock materials is carried away by running water or any other transporting agent.

* Chemical weathering :- It is also known as decomposition of rocks and it is a process in which rocks are broken down by chemical decay of minerals.

Ex:- Quartz is a very stable mineral therefore the rocks composed of primary quartz will undergo decomposition very slowly.

The agents of chemical weathering are air (gas) & water. The chemical weathering is mainly due to most of the rain water which is naturally acidic.

4b.

Explain railway blasts with examples?

Railway ballast are the foundation of railway track and provide just below the sleepers. The railway load from the wheels from the trains ultimately come on the ballast through rails and sleepers.

Types of ballast

- 1) Sand Ballast → Plain area minimum
- 2) Basalt Ballast → Maximum
- 3) Gneiss Ballast → Hilly regions.

4c.

Write a note on causes of Landslide.

Ans.:

Landslide are caused by disturbances in naturally stability of slope. They can accompany heavy rains or follow droughts, earthquakes or volcanic eruptions. mudslides develop when water rapidly accumulates in the ground and results in a surge of water saturated rock earth & debris.

Causes of landslide

- 1) Geology
- 2) Morphological
- 3) Human activity.

Module - 3

5a.

What is an outcrop? Describe the term strike & dip with neat sketch.

Ans.:

Outcrop is defined as External Exposure of the rock mass, which is also called as External part of the rock.

Strike :- It will be always horizontal. the direction of the line along an inclined beds which intersect horizontal plane is called Strike.

Dip :- It is maximum angle of inclination of an rock bed with the horizontal plane is known as Dip.

There are two types of Dip

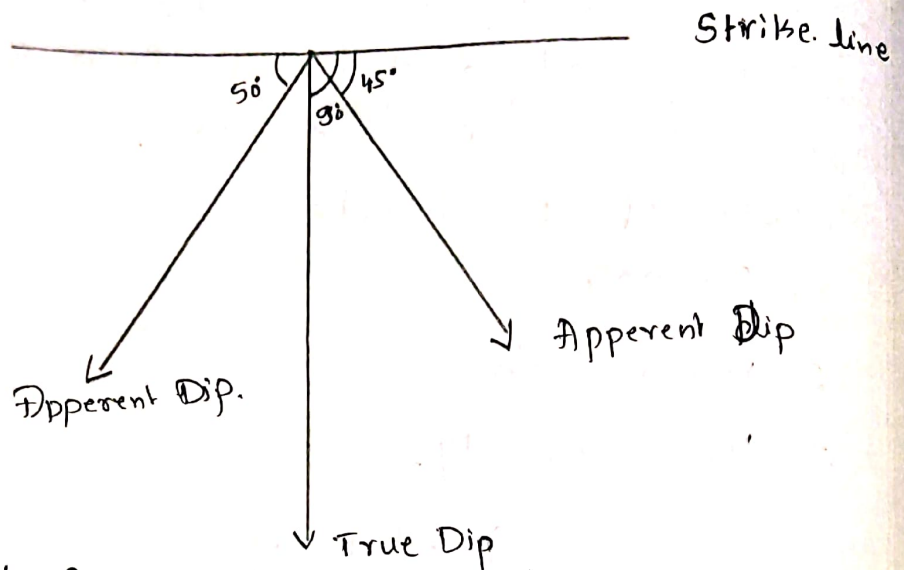
- 1) True Dip
- 2) Apparent Dip

1) True Dip :-

When the Dip of the layer is measured in a direction i.e essentially at the right angles to the straight line a particular layer (perpendicular to the strike line)

2) Apparent Dip:

Here the dip of the layer is measured in a direction which is not right angle and which is inclined is called apparent dip (other than 90° angles)



5b.
Ans:-

Explain floods, causes and its control.

Flood is most frequent type of natural disaster and occurs when overflow of water submerges land that is usually dry. Floods are often caused by heavy rain, rapid snowmelt or a storm surge from tropical cyclones or tsunamis in coastal areas.

A flood is a situation in which water temporarily covers land where it normally doesn't. This water comes from the sea, lakes, river, canals or sewers. It can also be rainwater. Floods can be described according to speed, geography or cause of flooding.

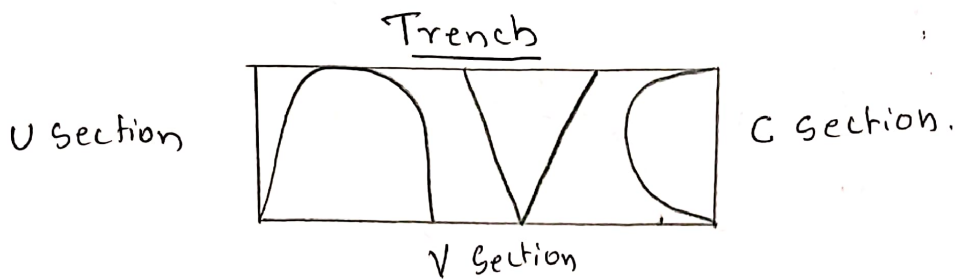
Floods have large social consequences for communities and individuals: as most people are unaware of the immediate effect of flooding including loss of human life, damage to property.

Flood control methods are used to reduce or prevent detrimental effect of flood water. Flood relief methods are used to reduce the effect of flood water or water level.

- * Installation of rock beams
- * Sand bags
- * Expansion of Dredging
- * Rock rip-raps
- * Maintenance of normal slope

5c. Write a note on Tunnelling Through the fold axis of an anticline.

Ans Tunnel is the underground excavations. Horizontal underground passage or pathway produced by excavation or occasionally by nature's action in dissolving a soluble rocks such as limestone. Vertical opening is usually called Ghatt. Tunnel have many uses for mining ores, for transportation including road vehicles, trains, Subways and canals.



There are three basic types of tunnel construction - in shallow common use cut & cover tunnel, construction trench & then covered over: Bored Tunnel, constructed in situ without removing the above ground.

6a. Briefly Explain Endogene & Exogene geological event.

Ans Epigene (Exogeneous) :- It is the process which derive the energy from external source of ultimately from sun. This process is mainly cause by geological agents such as running water blowing wind, glaciers, Temperature and ocean's.

Hypogene (Endogeneous) :- In similar way it is a process which originates within the earth crust (inside the crust) is known as endogeneous process.

Ex! - Earthquakes & Volcanic Eruption.

+ Weathering
+ Drainage
+ Earthquakes.

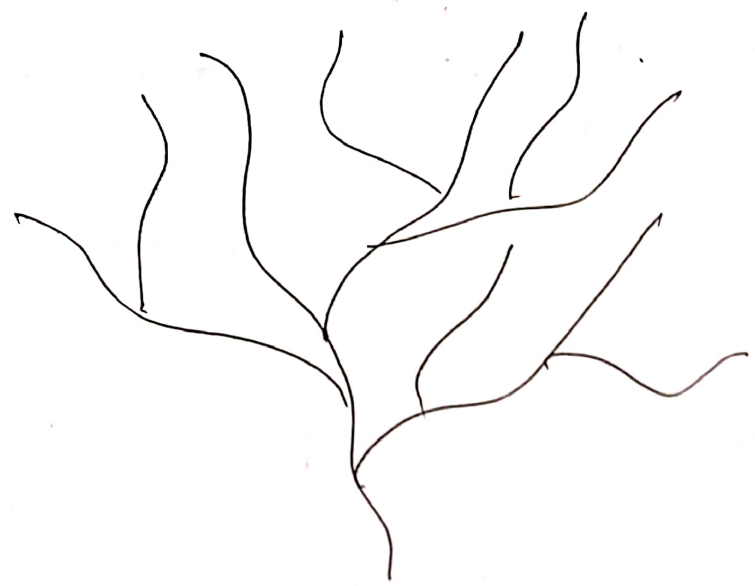
Q. 6

Describe the different drainage patterns of a river basin with neat sketch.

Ans: Natural or artificial removal of Soil particles from Surface or Subsurface by water.

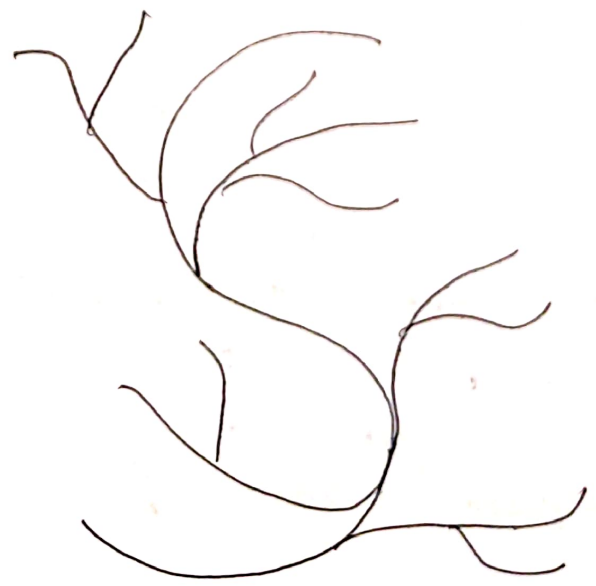
1) Dendritic Pattern :-

Streams Shows tree like arrangements this type pattern develops in terrains covered with uniform rocks such as horizontal strata.



2) Rectangular Pattern :-

Differential weathering of fault or joint systems in bent rocks localise the streams flow producing more ordered rectangular shape or pattern.



3) Parallel Pattern :-

This type of drainage pattern develops in a terrain of tilted rock beds and parallel faults the major stream occupies the fault while the tributaries which are parallel then these meet the stream approximately at same angle.



G.C.

Briefly explain Extrusive and Intrusive forms.

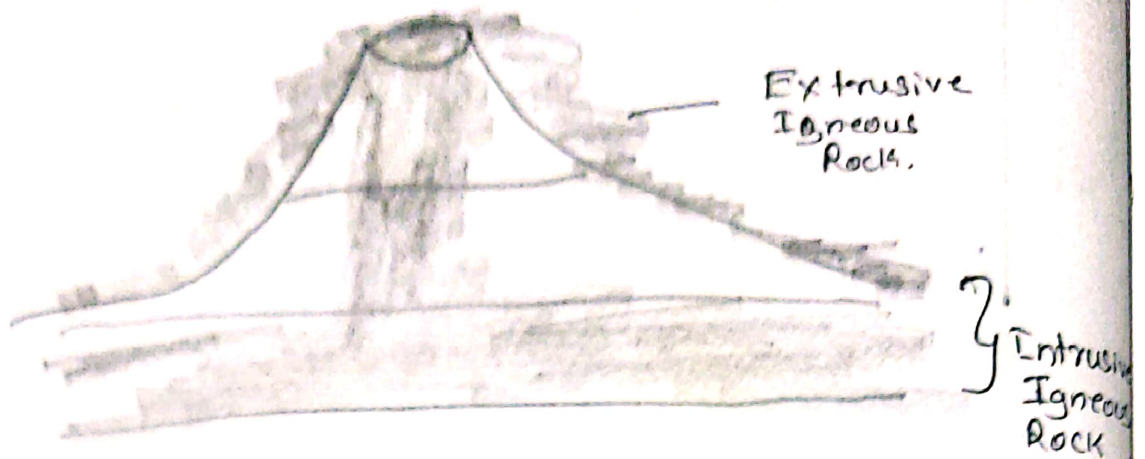
Ans

Extrusive Igneous Body :-

It is also called Volcanic Igneous Rock. They are formed by the cooling of lava on the surface of the Earth. The lava flows above the Earth surface these rocks found in a thin sheet like structure. Therefore they occupy larger areas.

Intrusive Igneous Body :-

These are also called as plutonic Igneous Rocks. These are formed by the cooling of magma or solidification of magma inside the earth surface. Whatever the igneous rocks found below the earth surface. Those are called as hypabyssal or plutonic igneous rocks.



MODULE - 04

7a) Explain Electrical Resistivity method for exploration of ground water.

Ans:- methodology:-

Electrical Resistivity method is one of the geophysical techniques used to investigate the nature of subsurface formation.

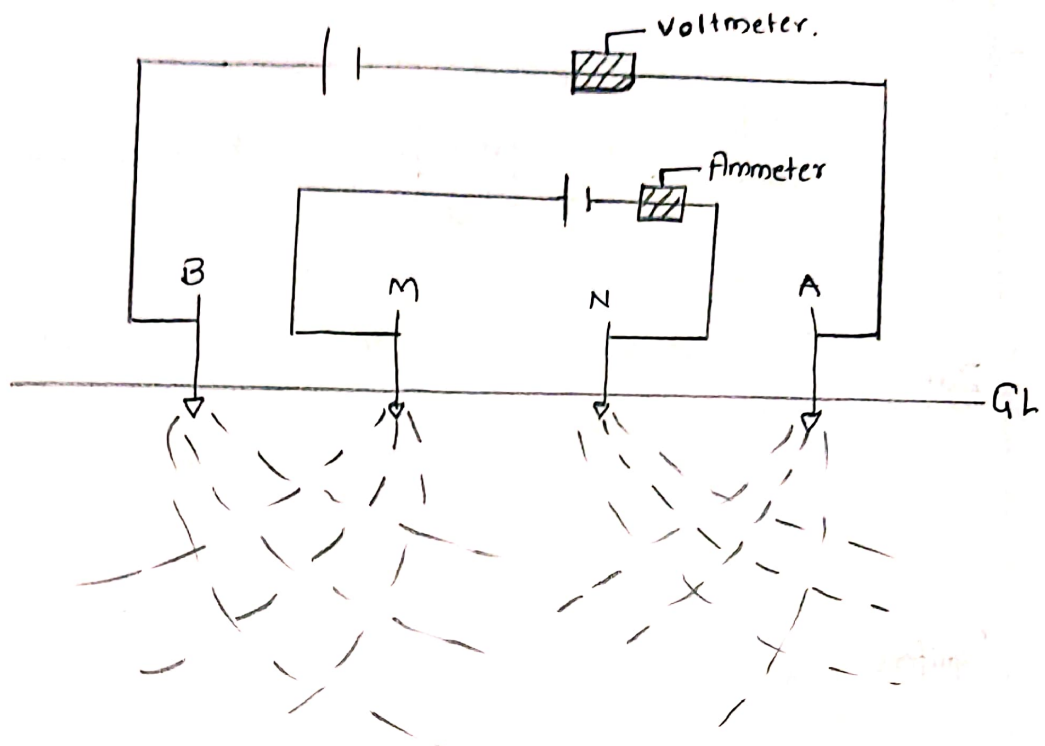
Electrical Resistivity method, current electrodes is injected into the ground through a pair of electrodes is called as current electrodes and potential electrodes difference across the ground measured with the help of another pair of electrode called potential electrode,

The ratio b/w potential difference and current gives the apparent resistance which depends on the electrode arrangement and on the resistivity of the subsurface formation.

There are several type of electrode arrangements (configuration) of which Wenner and Schlumbergers configurations are more popular.

In Wenner's configuration all the four electrodes are kept along straight line at equal distance.

In Schlumbergers the inner potential electrode (M & N) interval kept very small compared to outer current electrode.



7 b. Explain how the equality of ground water can be determined by SAR, RSC, GTH.

Ans:- SAR - Sodium Absorption Ratio :-

It is an indicator of the suitability of water for use in agriculture irrigation, as determined from the concentration of the main alkaline and earth alkaline cations present in water.

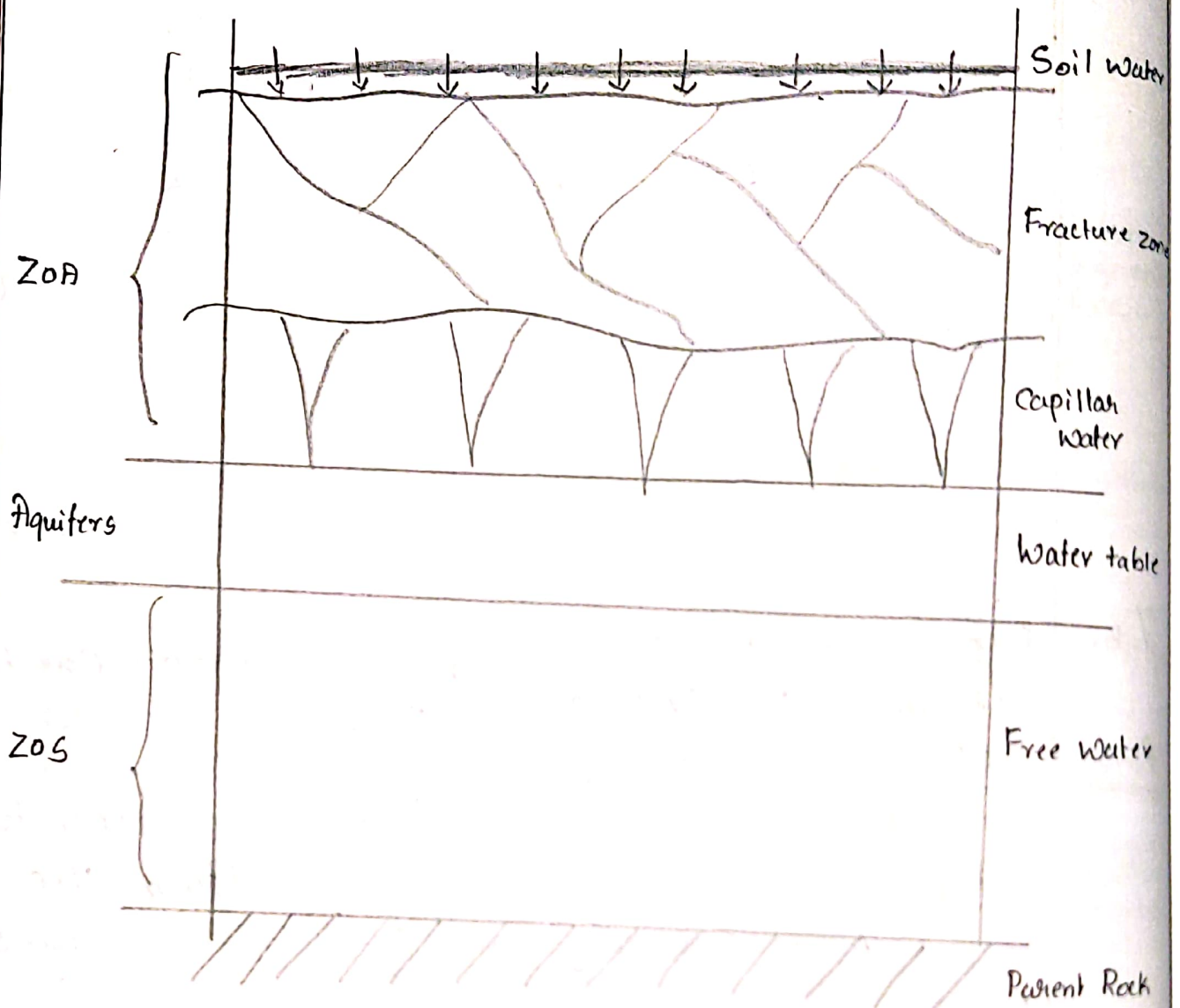
RSC - Residual Sodium Carbonate :-

It is index of irrigation water or soil water is used to indicate the alkalinity hazard for soil.

GTH - Ground water Total Hardness :-

It is the sum of the calcium and magnesium concentrations, both expressed as calcium carbonate, in milligrams per liter (mg/L).

8. a. Describe with a neat OR diagram, vertical distribution of Ground water.



Subsurface water is mainly divided into two types

- 1) Zone of Aeration
- 2) Zone of Saturation

Zone of Aeration

It is also called as unsaturated zone where it has been further divided into 3 types.

① Soil water:- It is adjacent to the ground surface consisting of top soil & sub soil. In this zone water is lost to the atmosphere mainly due to transpiration.

② Intermediate Zone:- It is also called as pellicular zone. It lies b/w soil zone and capillary zone. In this zone and present temperature basis water moves.

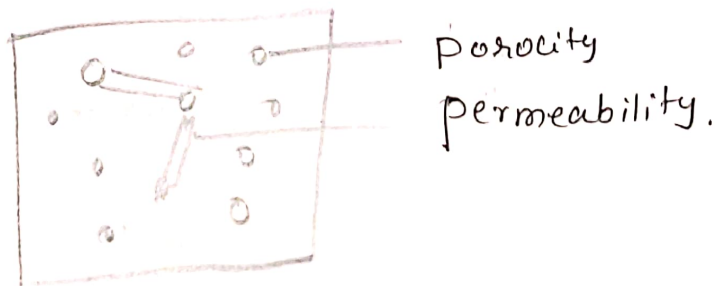
③ Capillary water zone :- It is the zone in which water poured by capillary action (fringe) thickness of this zone may vary from few centimetre to meter.

Water table:-

The surface below which all rocks are saturated with ground water is called as water table.

Zone of Saturation :-

It lies below the water table. In this zone all the pore spaces of the rock are completely filled with free ground water. As the opening in the rocks decrease with their depth, the lower limit of saturation is commonly found below the water table.



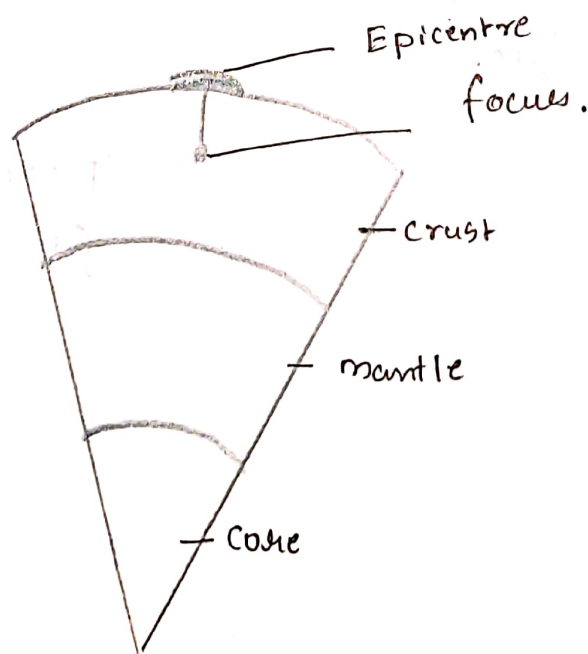
MODULE-5

Q.A. What is an Earthquake? Describe the Tectonic Causes of Earthquake and effects.

Ans:- Earthquake can be technically defined as sudden vibration of the earth crust due to internal or external forces that vertically shakes up a part of the crust and all the structures (civil & non-living) things which are existing on the earth crust.

Tectonic Earthquakes :-

These are the most common destructive events these are caused by displacement of blocks along the fractures are called as faults and here the focus of an earthquake indicates the depth at which the displacement originates. The mechanism of tectonic earthquake.

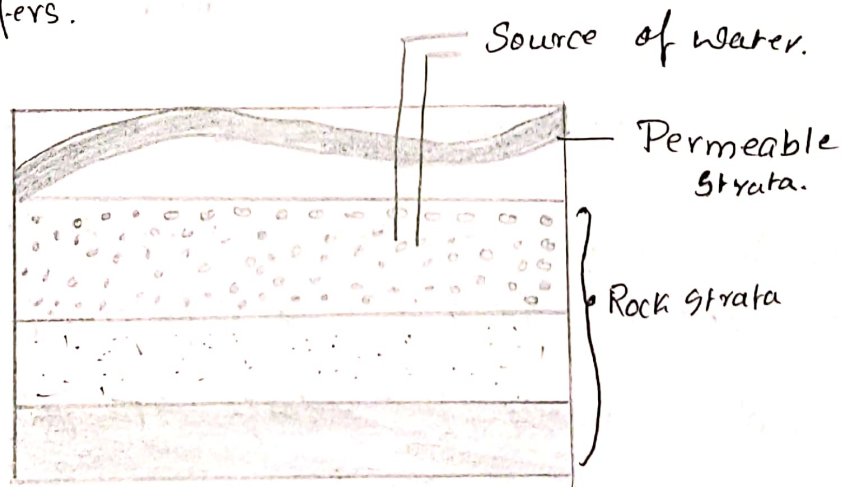


9 b) Explain Aquifer and its types.

Ans Aquifers are defined as yield porous rock bodies from ~~water~~ which water can be yield whenever it has been tapped the quality of an aquifers depends both on how much quality & quantity of water rocks formation can hold when tapped for the supply of water. It is also called as natural storage Reservoir.

Example:- Sandstone, gravels (Sedimentary Rocks) are generally said to be good aquifers.

Igneous rocks like granite, Basalt are bad aquifers but when we see fracture zone in igneous & metamorphic rock then they will called as source of aquifers.

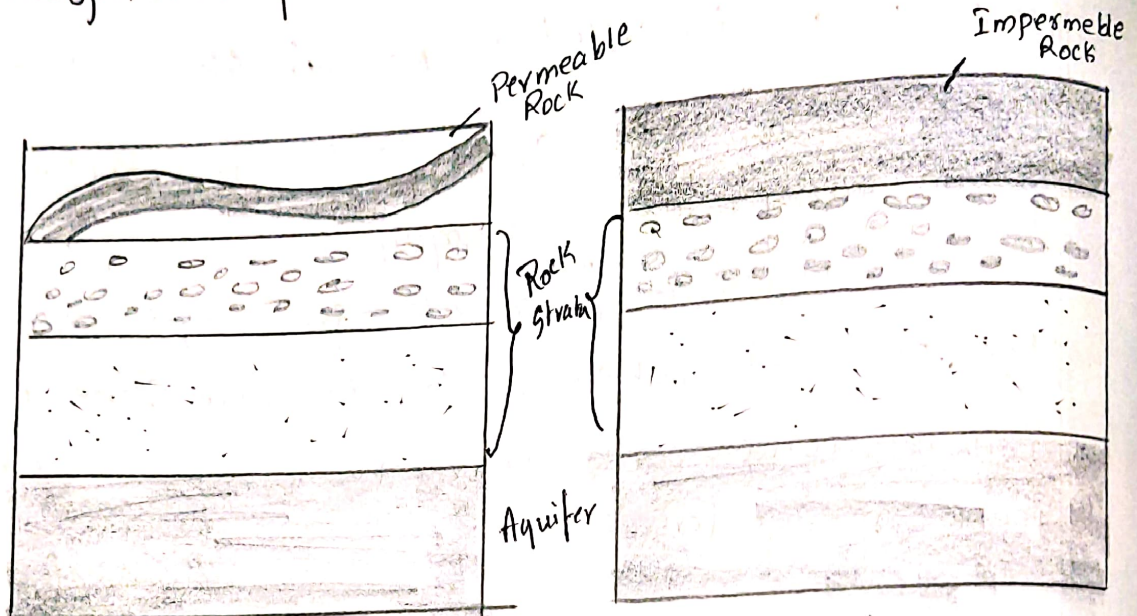


Types of Aquifers:-

1) unconfined Aquifers:- It is also called as water table Aquifers. It is most common type present in the field in this type the upper surface of water table is under atmosphere pressure which may be permeable rock strata over lying on an aquifer. Water occurring in this type of aquifer is called as free ground water. When the water is tapped to test the free water will rise to a level in well.

2) Confined Aquifers :-

It is a rock strata formation saturated with water and capable of yielding water when we tap it. But not like unconfined aquifers because it has an overlying impermeable rock layer which separates it from the influence of atmospheric pressure.



Unconfined

Confined

Q. Write a note on Specific Yield & Specific Retention.
Ans

Specific Yield :- The Capacity of Saturated rock to drain under the force of gravity

$$S_y = W_r / V$$

Water yield / Volume of Aquifers.

Specific Retention :- The Capacity of Saturated rock to retain water after drainage has occurred.

$$S_r = W_r / V$$

Water retention / volume of aquifers.

OR

10a. What is Remote Sensing? Write its Application in Civil Engg.

Ans: Remote sensing can be defined as obtaining the information about an object or phenomenon without making physical contact with the object.

In sensor; there are two types of sensors used in remote sensing.

1) Active

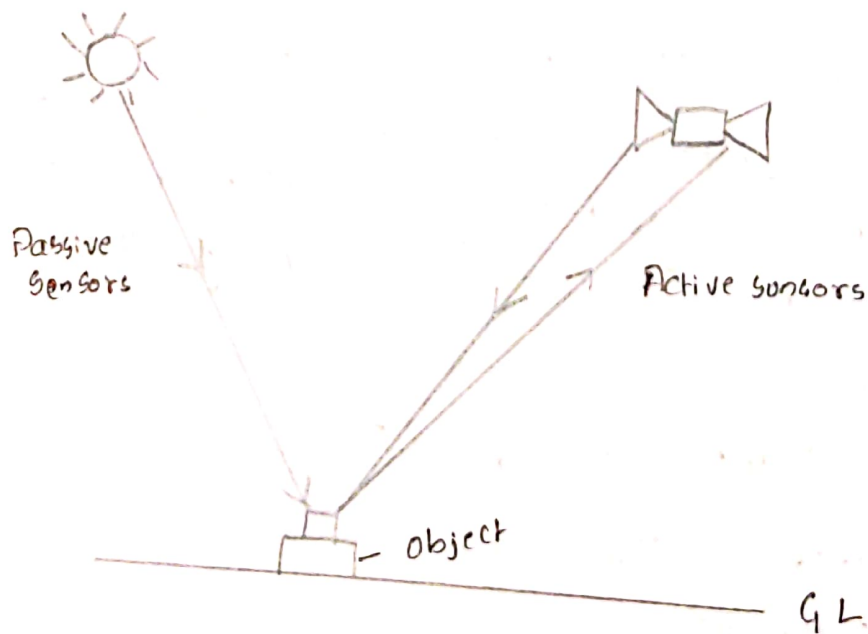
2) Passive

Active sensor:

Active sensors are sensors which does not require any external source of energy.

Passive Sensors

Passive sensors are the sensors which require external source of energy (sun energy)



Application of Remote Sensing (Scope of remote sensing)
There are probably hundreds of applications present
Some are typical applications as follows.

- 1) Geology :- To study the rock types, depositions of base minerals, mapping and structures of earth.
- 2) Oceanography :- To study the sea waves, temp of oceans, and mapping the ocean currents.
- 3) Hydrology :- To study the source of water from rainfall aquifers and snow.
- 4) Geodesy :- for measuring figure of ~~water~~ ^{earth} from the earth and its gravity field.
- 5) Agriculture :- To know the crop present in the specific areas and crop health analysing. The forest mapping.

10 b. What is GIS? Name the different components of GIS.

Ans :- A Geographical Information System (GIS) is a system that creates, manages, analyses and maps all types of data. GIS connects to map, integrated location data.

Components of GIS

- 1) Maps (Hardware)
- 2) Data (S)
- 3) Analysis (Software)
- 4) Methods.

1) Hardware:- Hardware is Computer on which GIS Software runs

2) Software:- Which provides tools to run & edit Spatial information.

3) Data:- The most important & expensive component of the GIS is data which generally known as fuel for GIS.

4) People:- People are user of GIS. They run the GIS Software.

06

10 c) Write an application on Global Positioning System (GPS) in Civil Engg.

1) Surveying:- Many companies in India & abroad uses GPS to locate different points, preparing contour maps.

2) Navigation:- It is used for navigation purpose in aircraft, ships & submarines.

3) Military:- It is now exceedingly used to locate the enemy targets and subsequently hitting them by GPS.

4) Public uses:- for public use simpler version are used for navigation purpose and difficult purpose.

06

Staff

~~Staff~~

Dean academic