VELAMMAL COLLEGE OF ENGINEERING AND TECHNOLOGY, MADURAI

DEPARTMENT OF CIVIL ENGINEERING

CE8392 - ENGINEERING GEOLOGY

TWO MARKS QUESTION AND ANSWER

UNIT - I

1. **Define geology**

The word geology is derived fom the greek word geologos and it means earth science. Geology is the science that deals with the study of the earth as a planet. it includes the essence of scientific studies dealing with the origin name and structure of the earth, evolution, modification and extinction of various surface and sub surface physical features.

2. **Define engineering geology**

It is the branch of applied science that deals with the geotechnical studies of major engineering projects and quality for construction. It plays aver vital roles in planning designing and constuction of safe, stable and economic engineering projects.

3.**What are the various branches of geology**

- Physical geology
- Geomorphology
- Mineralogy
- Petrology
- Historical geology
- Economic geology

4.**List any two importance of geology in civil engineering**

- Useful in proper planning of civil engineering projects for planning designing and construction.
- Useful in the development of water resources and town & regional planning

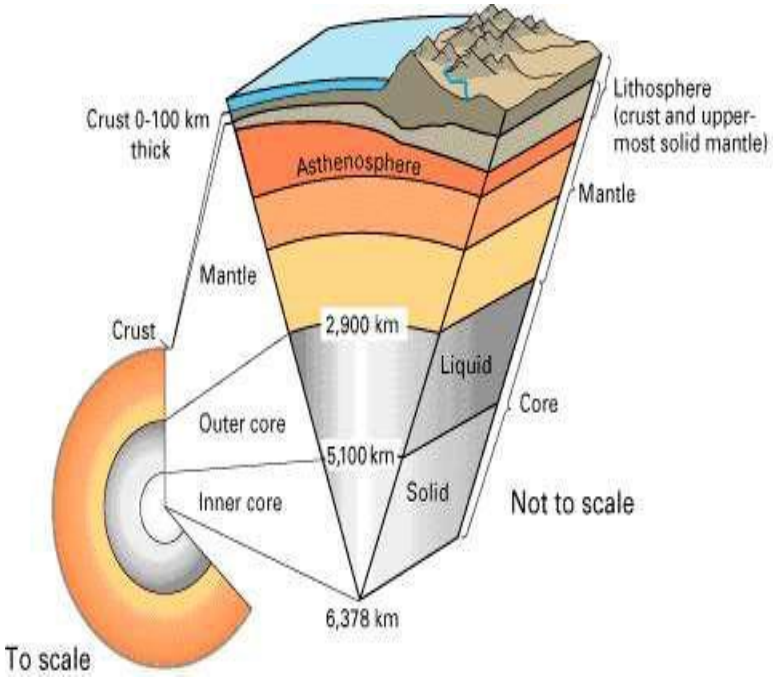
5. **What is the composition of earth**

- Crust - Low density minerals like quartz and feldspar
- Mantle – $MgSiO_3$ Iron, calcium aluminium, silicate, etc
- Core – sulphur and oxygen

6. **Define interior of earth**

The real interior of the earth is nowhere exposed to our direct observations. With our present scientific skills we can hardly penetrate more than a few kilometers below the Earth whereas the average radius of the Earth is taken as 6371km. As such our present views regarding the internal structure of the Earth are based on indirect geophysical methods. These involve application of very sensitive instruments, complicated calculations and imaginative interpretations. The study of seismic waves forms the single most important source of information for the interior of the Earth. The earth interior is divided in to three parts.

1. Crust
2. Mantle
3. Core



7. **Define mantle**.

It is the second concentric shell of the Earth that lies beneath the crust everywhere. This zone starting from the lower boundary of the crust (The mohorovicic discontinuity) continues upto a depth of 2900km. The exact nature of the mantle is as yet incompletely understood. It has been sub-divided into an upper mantle and a lower mantle, the boundary between the two layers being placed between 900-1000km. The structure of the upper mantle is believed to be quite complex. It is assumed to be made up of two layers:

B-layer: fairly uniform in composition, and nearly400 km thick.

C-layer: about 600km thick and where limited changes in chemicatl composition are indicated. The lower mantle is believed to have a less complex structure.

8. **Define core.**

It is the innermost concentric shell of Earth as deciphered from the record of seismic wave. It s existence was first suggestd by R.D. Oldham in 1906 and subsequently confirmed by other seismologists. The core boundary begins at a depth of 2900km from the surface and the region extends to the centre of the Earth (at 6371 km). Further studies of the behaviour of seismic waves reveal that the core itself can be distinguished into at least to main zones : the outer core and the inner core. The outer core (2900km to 4580km) resembles a liquid like substance because S-wave are not transmitted through this zone at all. (It is the characteristic of S waves or shear waves that they do not travel through liquids). The inner core, with a thickness of around 1790 km is believed to be a solid metallic body.

9. **What is the seismic properties of earth**.

If the earth were of uniform nature from the surface t0 the centre, seismic waves traveling through it would be recorded on the opposite and without undergoing any significance changes are interruptions in their velocity during their journey. Conversely, a major change in the velocity of seismic waves at some depth below the surface can be take to mean that there is a change in the nature of the medium at that particular depth. Such a major change in the velocity of seismic waves is called a seismic discontinuity and is of fundamental importance in the interpretation of the internal structure of the Earth.

A number of such seismic discontinuities have been repeatedly observed during many earthquakes in the past and the calculated depths at which they occur show remarkable agreement. As such, these are now accepted as established facts and believed to demarcate *different zones* within the body of the Earth. The tow most important seismic discontinuities are : the *Mohorovicic* discontinuity and The *Mantle-Core* discontinuity. These basic discontinuities demarcate three major internal zones in the constitution of the Earth : the crust, the mantle and the core.

10.**What is mohorovicic discontinuity**

This is the first major discontinuity iin the seismic records for the earth and is named after its discover . a mohorovicic it occurs in the seismic records at depth between 30-40 km below the continents, 5-6 km below the oceans and 60-70 km below the mountains. It is observed that both p and s waves on reaching these depths sharp increase in their velocity. Thus P waves attain a velocity of 7.75 km per second from an original velocity of 5.54 km/sec in the upper layer. Similarly S waves start travelling at 4.35 km/sec from an original velocity of 3.35 km/sec in the immediate upper layer.

Thus the Mohorovicic discontinuity marks the lower limits of the uppermost shell or sphere of the earth which is named as crust. The layer is merely 35 km thick (on an average) under the continents and 5-6 km under the oceans. Comparisons of the Earth with an old large sized apple will help clarifying the conception of crust. The crust is to the Earth what skin is to the apple: a very thin hard and wrinkled sheet or covering.

11.**Define weathering**

The process by which rocks are broken down and decomposed by the action of external agencies such as wind, rain, temperature changes etc is called as **weathering**.. (or) weathering is a process involving disintegration and decomposition of rocks. The disintegrated and the altered materials stay at the site of formation. If these materials are transported from the site with the help of natural agencies such as wind, running water etc, the process is called as erosion. Weathering is categorized as a mechanical, chemical, biological..

12.**What is physical weathering/ Mechanical Weathering.**

Mechanical weathering: In mechanical weathering, the process involves only fragmentation or break down of the rock into smaller fragments / pieces. In nature, the physical breaking of rocks are caused by several processes. Waterfalls, landslides during their fall cause extensive breakdown of rocks. Thus gravity contributes to mechanical disintegration of rocks. However, all the processes involve widening of the fractures, resulting in the detachment of blocks surrounded by the weak planes 13.**Explain the term chemical weathering**.

Chemical weathering involves chemical reactions resulting in the alteration of the rock leading to the formation of new alteration products. Water is the best fluid that directly affects rocks by way of Dissolution; Leaching (making porous); Hydration; Oxidation, Hydrolysis etc

14**.What is biological weathering**.

Biological weathering involves breakdown of rocks by living organisms (Bacteria & fungi). Living organisms release organic acids viz., Oxalic acid; Phenolic acid; Folic acid, Acetic Acid, Humic acid etc.. which cause decomposition of rocks. Some of the microorganisms penetrate into mineral crystals and remove specific ions from the inter layers. Eg: removal of K^+ from mica layers by fungi is an example of this type. Man is also responsible for unnatural weathering of rocks for construction of buildings, dams, bridges etc…

There are two process which are concerned with the biological weathering are

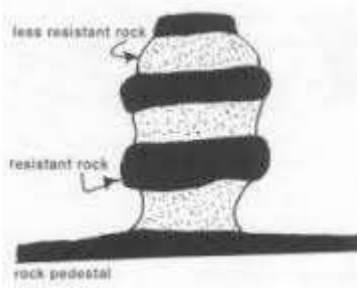
1. Bio- physical process
2. Bio- chemical process

15.**Explain spheroidal weathering**.

It is a complex type of weathering observed in jointed rocks and characterized with the breaking of original rock mass into spheroidal blocks the original solid roc is split into small blocks b development of parallel joints due to isolation. Simultaneously, the chemical weathering processes corrode the borders and surfaces of the blocs causing their shapes roughly into spheroidal contours.

16. **Explain pedestal rock with neat diagram**.

Pedestal rock: The rock particles, travel along with blowing wind are commonly more concentrated near the surface of the earth than higher up in the atmosphere blasts of wind, therefore , cause more of abrasion near the earth's surface than in the higher horizons. Vertical columns of rocks are thus, more readily worn out towards their lower portions and as a result pedestal rocks or mushroom rocks are formed (Figure 3).



17**. Differentiate between pot holes and Ventifact**

Ventifacts: Due to wind abrasion, small sized rock fragments having one, two, three or more polished faces. The polishing of the sides of the originally rough fragments is carried out by prolonged wind abrasion on the surface of each fragment. The exposed irregular surface of a rock fragments are gradually converted into a plane surface which may be smooth and even polished is called as ventifacts

Pot Holes:

These are variously shaped depression of different dimensions in the river bed that are excavated by extensive river erosion. The formation of a pot holes are initiated by plucking out of a piece of soft rock from the river bed by the river

18. Explain deflation.

Deflation is the process of simply removing the loose sand and dust sized particles from an area, by fast moving winds. Wind deflation can successfully operate in comparatively dry regions with little no rainfall and where the mantle is unprotected due to absence of vegetation.

19. **Define plate tectonics**.

The theory of plate tectonics supposes that the sphere of the earth is made up of 7 major and Several minor plates which are in constant motion relative to each other. The motions of the plates refer to the rigid slabs of the continental and oceanic crust that slides over the plastic zone of asthenosphere of the upper mantle. A fractures egg shell forms a good analogy to the spherical

plates of the earth. These plates are bounded by active linear zones causing volcanism and earthquakes.

20 .**What are the major plates**

1. North American plate
2. South American plate
3. Eurasian plate
4. African plate
5. Indo- Australian plate
6. Pacific plate
7. Antartic plate

21. **Define earthquake.**

Earthquakes are vibrations or oscillations due to sudden disturbances in the earth, which produce elastic waves which travel away in all directions from the point of origin

22. **Define Richter scale**.

Richter Magnitude is the logarithm to the base of 10 of the maximum seismic waves amplitude recorded on a seismograph at a distance of 100 from the epicenter.

Richter Earthquake Magnitudes Effects

Less than 3.5	Generally not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most slight damage to well-designed
	buildings. Can cause major damage to
	poorly constructed buildings over small
	regions.
6.1-6.9	Can be destructive in areas up to about
	100 kilometers across where people
	live.
7.0-7.9	Major earthquake. Can cause serious damage over larger areas
8 or greater earthquake	Can cause serious damage in areas several hundred kilometers across.

Richter's scale has magnitude numbers upto 10. But the maximum known magnitude is around 9.6 only. An earthquake magnitude of 6.0 involves energy of around $2.5x10^{20}$ ergs (equivalent to that of an atom bomb) while for magnitude of earthquake is 7.0, it is around $80x10^{20}$ ergs (equivalent to that of a Hydrogen bomb). For an earthquake of magnitude is 8.0, then the energy may be around $2500x10^{20}$ ergs (most powerful).

23.**Define Mercalli scale.**

Intensity	Effects
I	Not serious
II	Felt by few persons at rest, particularly on upper floors of buildings
III	Vibrations similar to a moving truck
IV	Windows and doors rattle; loose objects disturb
V	Breakage of dishes; wall plaster breaks
VI	Walls crack
VII	Slight to moderate damage in well-built structures
VIII	Falling of walls
IX	Ground cracks; breakage of underground pipes; considerable damage to buildings
X	Bending of rails; occurrence of land slides
XI	Buildings destroy
XII	Total destruction, surface displacements; objects thrown into air

The intensity of earthquake can be measured with the help of Mercalli scale. The intensity of earthquake can be measured with the help of Mercalli scale. Their write seismic zones of india measurements are expressed for degree of vibration.

24. **Define aquifer.**

It is defined as a rock mass, layer or formation which is saturated with groundwater and which by virtue of its properties is capable of yielding the stored water at economical costs when tapped. Gravels, limestone and sandstone generally form good aquifers when occurring in suitable geological conditions and geographic situations.

25.**Define confined and unconfined aquifer**.

Two basic types of aquifers are distinguished on the basis of physical conditions under which water can exist in them: the unconfined aquifer and the confined aquifer.

Unconfined aquifer: It is also called a water-table aquifer and is the most common type encountered in the field. In this type, the upper surface of water or the water table is under atmospheric pressure, which may be acting through the interstices in the overlying rocks. Water occurring in this type of aquifer is called free groundwater.

Confined aquifer: : It is a rock formation saturated with water and capable of yielding water when tapped but unlike unconfined aquifer, has an overlying confining pressure. Naturally held in this type of aquifer is not under atmospheric pressure but under a greater pressure due to the confining medium. The upper surface of water in a confined aquifer is called piezometric surface.

26.What is erosion.

Erosion is meant disintegration of the rocks by a natural agent. Streams are the most powerful sub aerial agent of erosion. They perform their erosion works in the following ways: By hydraulic action, Cavitations, Abrasion, Attrititon, Corrosion

27.**Define seismology**.

Seismology, the science dealing with the natural phenomena relating to earthquakes. The Greek word *seismos* means shaking. Earthquakes are vibrations or oscillations due to sudden disturbances in the earth, which produce elastic waves which travel away in all directions from the point of origin. These elastic waves are called seismic waves.

28.**Define denundation**.

It is general term used when the surface of the earth is worn away by chemical as well as mechanical actions of physical agents and the lower layers are exposed. This happens when the rocks were exposed for a sufficient length of time to the attacks of physical agents.

29.**Define the following term (i) focus (ii) epicenter**

Focus:

The exact spot underneath the earth's surface, at which an earthquake originates, is known as its focus.

Epicentre:

The earthquake then moves in the from of wave which are spread in all directions. These waves first reach the point at the surface, which is immediately above the focus or origin of the earthquake. This point is called epicentre.

30. **What are the causes for earthquake**?

The earthquake may be caused due to various reasons:

- Earthquakes due to superficial movements.
- Earthquake due to volcanic eruptions.
- Earthquake due to folding or faulting

31.**List out the various aftershock effect of earthquake**.

- Loss of habitat
- Economic loss for the country
- Tsunami
- Forest fire
- Floods, Dam collapse, Landslide, volcanic eruption
- Death and injury of peoples

32.**Define earthquake resistance structures**.

The earthquake resistance structure is different from the earthquake proof structure. The earthquake proof structure completely safe without any damages. but the cost of earthquake proof structure is too high whereas the earthquake resistance structure protect the structure from failure.

33. **How oxbow lake is formed?**

isolate curved or loop shaped parts of a meandering stream often contains some supplies of water called as oxbow lakes.

34. **What is traction?**

Traction is when large materials such as boulders are rolled and pushed along the river bed by the force of the river.

35.**What is perched water table?**

A perched water table is an accumulation of groundwater that is above the water table in the unsaturated zone. The groundwater is usually trapped above an impermeable soil layer, such as clay, and actually forms a lens of saturated material in the unsaturated zone.

36.**What are the discontinuities found in the earth?**

The propagation of these seismic waves (P-waves and S- waves) inside the earth demarcates different zones, by two major and three minor discontinuities. These discontinuities are due to differential composition and nature of the earth.

The major discontinuities are

a. Mohorovicic discontinuity (crust-mantle discontinuity) and

b. Gutenberg discontinuity (mantle - core discontinuity).

The minor discontinuities are

a. Conrad discontinuity (sial - sima) in crust

b. Repetiti discontinuity (outer mantle - inner mantle) and

c. Lehmann discontinuity (outer core- inner core)

37.**Difference between stalactites and stalagmites?**

Stalactites and stalagmites are formed in caves by the deposition of calcium carbonate. Stlactites are the conical deposits that form at the roof of the cave and hang downward while stalagmites are those that form on the bottom of the cave and grow upward as water drips down from above.

38.**What is connate water?**

In geology and sedimentology, **connate** fluids are liquids that were trapped in the pores of sedimentary rocks as they were deposited. These liquids are largely composed of **water**, but also contain many mineral components as ions in solution.

39. **What is desert pavement?**

A mosaic of pebbles and large stones which accumulate as the finer dust and sand particles are blown away by the wind.

40. **What is meant by continental drift?**

The gradual movement of the continents across the earth's surface through geological time.

41. **What is Conrad discontinuity?**

A boundary within the Earth's continental crust that can be detected seismically at about 10–12 km depth, although exploratory deep drilling has failed to locate it. The boundary separates the crust into a lower, basic layer and an upper, granitic layer.

42. **What is meant by freeze thaw?**

Water may get into a crack in a rock and freeze. As the water turns into ice it expands and causes the crack to open a little. When it thaws the ice melts and changes back to water. Repeated freezing and thawing weakens the rock and splits it into jagged pices. This type of weathering is common in mountainous areas where temperatures are often around freezing point.

43. **How Oasis is formed?**

In many desert areas, deflation produces hollows or basin with their bottom at water table. Such basins containing some water are called oasis.

44. **Distinguish between swash and backswash**

As waves approach the shore and water becomes shallower, friction occurs with the seabed. This slows down the base of the wave. However, because the top of the wave is not affected by the friction, it keeps its energy so the wave becomes higher and steeper until eventually it breaks.

The water which rushes up the beach is called **swash.**

As the wave loses its momentum, energy is transferred back to the sea – this return flow is called **backwash.**

The force of the swash and backwash determines whether the waves are **constructive waves** or **destructive waves.**

45.**Define deflation.**

Deflation is the process of simply removing the loose sand and dust sized particles from an area, by fast moving winds. Wind deflation can successfully operate in comparatively dry regions with little or no rainfall and where the mantle is unprotected due to absence of vegetation.

46.**What do you understand by spheroidal weathering?**

When weathering occurs, part of the disintegrated rock material is carried away by running water or any other transporting agent. Some of them are left on the surface of the bedrock as residual boulders. These boulders are then rounded off to spheroidal cores by the simultaneous attack of eroding agents on all sides. It is often seen that these boulders have an onion like structure. This kind of weathering is called spheroidal weathering.

PART B

1. Write short notes on:
    i) Crust ii) Mantle iii) Core iv) Stratosphere v) Atmosphere
2. Explain briefly about Branches of geology?
3. Write a critical essay on weathering and its significance in engineering construction?
4. Give an account of geological work of river explaining briefly some major geological features?
5. Give an account of geological work of wind explaining briefly some major geological features?
6. Write short notes on
    a) Hydraulic action b) Abrasion c) Attrition d) Corrosion
7. Explain the causes, classification of earthquake?
8. Briefly explain the origin and occurrence of ground water?

UNIT II

1. **What is a mineral**?

A mineral is a naturally occurring inorganic solid substance that is characterized with a definite chemical composition and very often with a definite atomic structure.

2.**What is ore mineral**?

Ore forming minerals are those which are found in abundance in the rocs on the crust but beneath ground and have high economic value.

3.**Define rock forming mineral**.

A few minerals(not more than one hundred) form the great bulk of the rock of the crust of the earth. These very common minerals have been grouped together as roc forming minerals. Among the roc forming minerals, we shall confine our stud to the following three groups: 1) sillicates 2) oxides 3) carbonates.

4.**List the various physical properties of minerals**.

Physical, chemical & optical properties

Physical properties

i) Colour

ii) Lustre

iii) Streak

iv) Hardness

v) Cleavage

vi) Fracture

vii) Tenacity

viii) Structure

ix) Specific gravity

x) Form

xi) Miscellaneous

5.**What is the various colour classification of mineral?**

Idiochromatic- fairl constant colour (eg) metallic minerals like copper group.

Allochromatic- variable colour (eg)non-metallic minerals like quartz.

Pseudochromatic- false colour. It is seen to show a set of colours in succession.

The change of colour is attributed to simultaneous reflection and refraction from the mineral surface at different locations.

6.**Write the difference between lusture and streak**.

The colour of mineral in poeder form is called as streak

the appearance of mineral surface in reflected light is called as lusture.

7.**Define Mohs scale of hardness**.

Mohs scale of hardness comprises ten minerals arranged in order of ascending hardness. The softest is assigned a value of 1 and the hardest a value of 10.

Talc = 1;	Feldspar = 6;
Gypsum = 2;	Quartz = 7;
Calcite = 3;	Topaz = 8;
Fluorite = 4;	Corundum = 9;
Apatite = 5;	Diamond = 10;

8.**What are the various fractures present in a mineral**?

The common types of fractures are even, uneven, conchoidal, splintry, hackly and earthy.

9.**List any two structure of a mineral**.

Tabular structure, elongated structure, bladed structure, lamellar structure, fibrous structure, granular structure.

10.**Define the specific gravity of a mineral.**

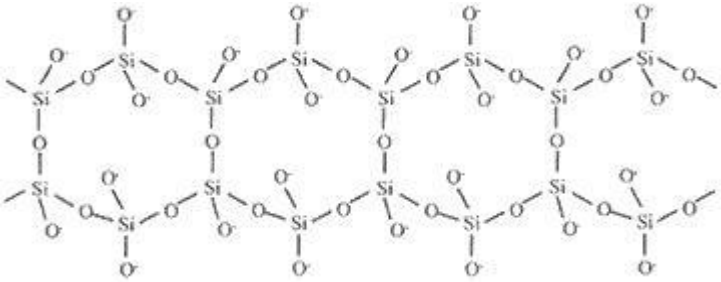
In mineralogy, the term specific gravity signifies “the ratio between the density of a mineral and that of water at 4^{o} Celsius”. It has no unit.

11.**Define phosphorescence characteristics of a mineral**.

It is similar to fluorescence in essential character but in this case light is emitted by mineral not during the act of exposure to radiation but after the substance is transferred rapidly to a dark place.

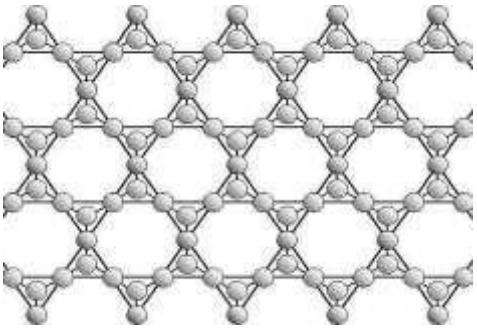
12.**Define chain structure of silicate group minerals**.

All silicates are simple or complex repetition of a fundamental silicon-oxygen Tetrahedron (represented Ba a formula SiO_4). In this setup the small SiO_4 is situated at the center and is surrounded on the four sides b relatively big oxygen ions. The dimensions of the unit cell of silicon-oxygen tetrahedron is constant. This fundamental unit is repeated, lined and joined in different was to get different types of silicate structure.



13.**Define sheet structure with diagram**

Sheet- silicate structure is two-dimensional continuation of silicon tetrahedron commonly results in a layered or sheet structure. In this structure three of the four oxygen in unit tetrahedron are shared with neighboring tetrahedron.



14.**What is the chemical composition of feldspar group**.

In chemical constitution, feldspar are chiefly aluminosilicates of N, K and ca with following general formula: WZ_4O_8

In which W= N, K, Ca and Ba

Z = Si and Al

15.**Compare between orthoclase feldspar and microcline feldspar**.

Characters	Orthoclase feldspar	Microcline feldspar
Crystal System	monoclinic	Triclinic
Cleavage	Two sets of perfect cleavage	Perfect cleavage
Colour	Various shades of pink and red	Bright green, cream white
Streak	White	White
Fracture	uneven	Uneven

16.**What are the minerals grouped under pyroxene group of minerals**?

(a) Orthorhombic pyroxenes

(b) Monoclinic pyroxenes

17. **Comparebetween hypersthenes and diospide**.

Characters	Hypersthenes	Diopside
Crystal system	Prismatic	monoclinic
Lustre	submetallic	vitreous
Colour	Brown- green , greenish black, brown	green, white,darish-green
Specific Gravity	3.4 to3.5	3.2 to3.4
Fracture	uneven	Uneven

18.**Write the physical and chemical properties of Augite minerals**?

The augite is usually seen in dark green to black and the streak of augite is white in colour. It occurs in basic igneous and metamorphic rocks. The chemical composition present in the augite is silicates of calcium, magnesium, iron and aluminium.

19.**Define the chemical composition of amphibole group**.

Amphibole minerals are also meta-silicates with a Si: O ratio of 4: 11. The metallic ions present in amphiboles are Ca, Mg, Fe and sometimes Mn,Na, and H . presence of (OH) ion, which may be replaced b F and Cl, is another peculiarit of chemical composition. The general chemical formula: $[Si_4O_{11}]_2[OH]$

20.**Define hornblende**.

Hornblende is a common rock- forming mineral in igneous and metamorphic rocks. Amphibole, a metamorphic group of rock may be made up cheifly of hornblende. Because of their wide spread occurance, hornblende and augite are taken as representative minerals from the amphibole and pyroxene groups respectively.

21. **Compare between pyroxenes and amphiboles**.

Character	Pyroxenes	Amphiboles
Crystallisation	Crystallize in orthorhombic and monoclinic systems. Crystals are commonly short and stout.	Crystallize in orthorhombic and monoclinic systems. Crystals are commonly long and slender.
Cleavage	Perfect and prismatic. Cleavage angle is 87^o	Perfect and prismatic. Cleavage angle is 124^o

22. **List the various types of mica**.

23. **Define the atomic structure of mica**.

The basic units of silicate sio4 tetrahedra are linked at all their three corners resulting in Si:O

ratio of 2:5. Such a linkage when extended in two directions results in sheets of SiO_4, tetrahedra. Two such sheets also placed one above another that their vertices point inwards-towards each other. It is here that they are mutually cross linked with a metallic ion, commonly or Mg. other groups, special the hydroxyl group, are also incorporated in between these cross links.

24. **Compare between muscovite and biotite mica**.

CHARACTER	MUSCOVITE MICA	BIOTITE MICA
Crystal system	Monoclinic; commonly occurs in platy form with pseudo symmetry of hexagonal or orthorhombic type.	Monoclinic; commonly occurs in tabular sheets or short prismatic plates.

Streak	Colourless	Colourless

25. **What are the various properties of quartz**?

It is colourless when pure. The specific gravity is in between 2.65 to 2.66. The cleavage is generally absent.

S No	Properties	Observations
1	Form	Massive, crystals
2	Color	Quartz occurs in different colors. Common colors are white, grey, purple, brown, pink etc
3	Streak	Colorless (harder than streak plate)
4	Lustre	Vitreous
5	Fracture	Conchoidal
6	Cleavage	Absent
7	Hardness	7
8	Density (Sp gravity)	2.6 – 2.7
9	Varieties	Flint, Jasper, Amethyst (purple or violet color), Opal, rose quartz (pale pink color). Milky quartz (milky white in color) .

26. **Compare between calcite and magnetite**.

CHARACTER	CALCITE	MAGNESITE
Crystal system	hexagonal- Rhombohedral	hexagonal- Rhombohedral
Cleavage	Highly perfect,rhombohedral. Parting is also common	hexagonal- Rhombohedral
Colour	Pure calcite is white and transparent.milky-white,opaque varities are also common.small proportions of impurities give various tints to calcite,pin, red, violet,blue, green and black.	White-when pure; Shades of grey and brown are also common.
Hardness	3	$^{3.5}$ to 4.5

27.**Define clay mineral**.

Clay minerals are essentially hydrous aluminium silicates. It si mainly of a group of crystalline substances. Important caly minerals are kaolinite, talc, Smectite, chlorite, illite

28. **What are the different types of clay minerals**? kaolinite, talc, Smectite, chlorite, illite, kynaite

29. **Explain the engineering importance of quartz group of minerals**.

Quartz is one of the most useful natural materials. Its usefulness can be linked to its physical and chemical properties. It has a hardness of seven on the **Mohs Scale** which makes it very durable. It is chemically inert in contact with most substances. It has electrical properties and heat resistance that make it valuable in electronic products. Its luster, color and diaphaneity make it useful as a gemstone and also in the making of glass.

30. **List any out uses of clay minerals**.

- Manufacture of Ceramics
- Talcum powder
- Filter in paint and Used in rubber Industry.

PART – B

1. Describe physical properties of Feldspars family
2. Describe the following rocks of the engineering properties occurrences and distribution.
    a) Granite
    b) Basalt
    c) Sandstone
    d) Marble
3. Describe the physical properties and engineering properties of Quartz and Feldspar group of minerals?
4. Give a detailed description of the physical properties of the various minerals with example?
5. Give a detailed account of the types, properties, behavior and Engineering significant of clay minerals?
6. Describe physical properties of Feldspars family

UNIT – III

1. What is mean by Rock?

It is defined as "natural solid massive aggregates of minerals forming the crust of the earth".

2. Define Petrology?

The branch of geology dealing with various aspects of rocks such as their formation, classification and occurrence is called petrology.

3. List out the various types of rocks?

1. Igneous rock
2. sedimentary rock
3. Metamorphic rock

4. What is mean by magma?

The hot molten material occurring naturally below the surface of the earth is called magma.

5. Define Igneous rock?

All rocks that have formed form an originally hot molten material through the process of cooling and crystallization may be defined as Igneous rocks.

6. List out the various types of igneous rock?

1. Volcanic rock
2. Plutonic rock
3. hypabassal rock

7. Compare between monomineralic rock and polymineralic rock with example?

Monomineralic rock:

Rocks composed by a single mineral (e.g) pyroxenite which is composed at pyroxene only.

Polymineralic:

Rocks composed at more than one mineral and polymineralized rock. (e.g) Granite.

8. Differentiate: Plutonic rock and volcanic rock?

Igneous rocks which have formed at a depth are known as plutonic igneous rock. (e.g granite) and those formed from lava and formed mainly at the surface are known as volcanic igneous rock (e.g Basalt)

9. Define Texture of Igneous rock:

The term texture is defined as the mutual relationship of different mineralogical constituents Q is a rock. It is determined by the size, shape and arrangement of these constituents within the body of the rock.

10. Give the categories of Texture:

1. Equigranular texture
2. In equigranular texture
3. Directive texture
4. Inter growth texture
5. Intergranular texture

11. Define the structure of igneous rock?

These rocks are developed on a large scale in the body of an extrusion or intrusion, giving rise to conspicuous shapes or forms are included under the term structure.

12. What are the various types at structure in igneous rock?

The structures are:

1. flow structure
2. Pillow structure
3. ropy and blocky lava
4. Spherulitic structure
5. Orbicular structure

13. How will you distinguish the three kinds of rocks?

The igneous rocks are characterized by its hard, compact, massive, interlocking and strong structure.

The sedimentary rocks are characterized by it bedded or layered structure.

The metamorphic rocks are characterized by its banded or foliated structure.

14. Define Granite

It may be defined as plutonic light colored igneous rocks. These are among the most common igneous rocks. The work granite is derived form latin word granum meaning a grain and obviously refers is the equigranular texture of the rock.

15. What are the various types of sedimentary structure?

Mechanical structure:

i. Stratification or bedding
ii. Lamination and cross bedding
iii. Ripple marks
iv. Rain marks
v. Joints land cracks

Chemical structure:

i. Concretionary structure
ii. Ooitic structure
iii. Geode structure

Organic structure

i. Foot print of animals
ii. Leaf impression of plants
iii. Markings of insects

16. What is mean by facies? And types of facies

The concept of formation of a sedimentary rock is a particular type of environment is explained by the term facies.

Three kinds of facies

1. Continental facies
2. Transitional facies
3. Marine facies

17. What are the factors allowed in texture of sedimentary rocks?

The factors are:

i. Origins of Grains
ii. Size of grains
iii. Shape of grains
iv. Packing of grains
v. Fabric of grains
vi. Crystallization trend

18. Define the following term:

i. Rudites
ii. Arenites
iii. Lutites

Rudites:

There are also called rudaceous and include all coarse grained rocks of heterogenous composition. Rudites are made p of bounders, cobles and Pebbles collectively known as gravels.

Arenites:

These are also called arenaceous rocks. These are made up to sediments of sand grad (2 mm - / 16 mm)

Lutites:

These are also called argillaceous rocks. It may be defined as sedimentary rocks of the finest grains size.

19. Define conglomerates:

These are sedimentary rock at clastic nature and also belong to rudaceous group. They

consist mostly of rounded fragments of various sizes but generally above 2mm. Cemented together is clays or mixed matrix.

20. What do you understand by metamorphism?

It may be defined as the response in solid rocks to pronounce charged of temperature, pressure and chemical environment. In other cases metamorphism means the partial or complete crystallization of a rock and the production of new structures.

21. What are the three kinds of metamorphism?

1. Thermal metamorphism
2. Dynamic metamorphism
3. Dynamo thermal metamorphism

22. What is mean by metasomatism?

It may define as metamorphic process involving essentially formation of new minerals by the mechanism of chemical replacement of pre-existing minerals under the influence of chemically active fluids.

23. Define metamorphic rocks:

Metamorphic rocks are defined as these rocks which have formed through the operation of various types of metamorphic process on the pre existing igneous and sedimentary rocks involving changes in texture, structure and mineralogical composition.

PART - B

1. Describe the major distinguishing features of Igneous, Sedimentary and Metamorphic rocks based on various criteria.
2. Describe two rocks, each from Igneous, Sedimentary and Metamorphic group.
3. Describe the various engineering properties of rocks and laboratory tests to be conducted to determine these Properties.

UNIT – 1V

1. Define Dip?

The inclination of the bedding planes, with the horizontal, is called dip and is always expressed in degrees.

2. Explain true dip?

It is the maximum inclination of bedding planes with the horizontal, or in other wards it is the inclination of the direction of which water would flow, if poured on the upper surface of the bed.

3. Explain apparent dip?

The inclination of the bedding planes, with the horizontal, in any other direction,
other than the direction of the true dip, is know as the apparent dip. The value of apparent dip is always less than the true dip.

4. Define strike?

It is the direction, measured on a Horizontal surface, of a line formed by the
intersection of dipping bed with the horizontal plan. It is always expressed in terms of main direction ie, is North, South, East or West.

5. What is mean by folds?

The earth's crust is tilted out of the horizontal and is bent into folds. Such a fold may ranges from a microscopic crinkle to great arches and troughs even up to 100 kms across. A set of such arches and troughs is called a fold.

6. What is mean by Anticline and Syncline?

When the beds are unfolded in an arch-like structure, it is called an anticline. When the beds are down folded in trough like structure, it is called a Syncline. It may be noted that in an anticline the oldest rock is in the centre, where as in a syncline the youngest rocks is in the centre.

7. Explain Causes of folding?

The interior of the earth is getting cooler and cooler day by day, which is sure to
Cause some shrinkage in the earth's crust. This stink age is responsible for the
Compressive and shearing stress to be developed within the earth's crust. Some time these stresses are small in magnitudes but go on exerting pressure for a sufficient length of time and result in buckling or folding of the layers of the earth's crust.

8. What are types of folds?

a) Symmetrical fold
b) Asymmetrical fold
c) Overturned fold

d) Isoclinal fold
e) Recumbent fold
f) Plunging fold
g) Open fold
h) Closed fold
i) Anticlinorium
j) Synclinorium
k) Dome
l) Basin
m) Nonoclinal fold.

9. Define Faults?

Faults are fractures, along which the movement of one block with respect to other, has taken place. This movement may vary from a few centimeters to many kilometers depending upon the magnitude of the stresses, and the resistance offered by the rocks.

10. Explain the Causes of Faulting?

The interior of the earth becoming cooler day by day, which is sure to cause some shrinkage in the earth's crust. This stink age is responsible for the stress to be developed within the earth's crust. These stresses, when greater in magnitudes exert so much pressure that the layers of the earths crust are fold due to compressive stresses and after wards when the stresses are released, fractures are formed. If the stresses still continue, the blocks move up or down along the fault plane depending upon the direction of stresses and their intensity. Such a fracture, along which a movement has taken place, is called a fault.

11. What are the classifications of faults?

Faults are classified on the basis of their apparent displacement, ie, the direction of movement, of one block, with respect to the other along the fault plane.

12. What are the criteria for the recognition of a fault?

1) Discontinuity of strata
2) Repetition and omission of strata
3) Physiographic features
4) General.

13. What is mean by Joints?

When sufficient tensile stress in developed between two successive points, a crack is developed at right angle to the direction of the stress, such cracks are called joints.

14. What is mean by Master joints?

The joints always occur in sets and groups. A set of joints means, joint occurring in the same dip or strike. A group of joints means a few sets of joints having almost the same trend. If a few sets or groups of joints appear for a considerable length in a rock, such joints are called major joints or master joints.

15. Define out crop?

A little consideration will show that the out crop of a rock is affected by the angle of dip also. If a rock has a vertical dip then the outcrop will be less, than that when the same rock is dipping at some angles.

16. What are the different forms of out crops?

a) Out lier
b) In lier
c) Unconformity
d) Overlap
e) Cross bedding.

17. Define over lap?

An over lap is particular type of an unconformity, in which the overlying strata extends so as to over lap the underlying strata.

18. Define cross bedding?

Sedimentary beds or layers are generally parallel to one another. But, sometimes, it has been observed that the beds lie slightly oblique to the major bedding planes.

19. What are the classifications of joints?

a) Geometrical classification

Stricke joints, Dip joints, Oblique joints

b) Genetic classification

Tension joints, shear joints

20. What are the methods of Geophysical Exploration?

Depending upon the type of energy field used, the following methods may be used. Seismic method, Electrical method, Gravitational method, Magnetic method, Radiometric method, Geothermal method.

PART – B

1. What is a fault? Discuss the various types of faults and write about the engineering applications.
2. What is a fold? Discuss the various types of faults and write about the engineering applications.
3. What is a joint? Discuss the various types of faults and write about the engineering applications.
4. Explain in detail the role of electrical methods of subsurface investigation in civil engineering practice.
5. Describe seismic refraction survey to de conducted for determining the depth of bed rock.
6. Discuss in detail electrical method of investigation for ground water exploration.
7. Classify folds and faults in rocks and explain how they influence the design of dams.
8. Classify and describe joint structures with neat sketches and also write their role in dam and tunnel construction.
9. Give a detailed account of the various geological structures and their role in selection of sites for Engineering projects.
10. Describe fault structures with neat sketches and also write their role in dam and tunnel construction.

UNIT – V

1. Define remote sensing.

Every object on earth emits its own internal energy according to its molecular and
Atomic structure, in addition to reflecting sun light during the day time. This radiations can be registered by sensors in several wavelengths, including those in the infrared and microwave regions of the spectrum. When such sensors are installed on aircrafts or on satellites they can record the earth's objects from for off distances. Such distant (Remote) acquisition of information about the objects on the earth's surface is known as remote sensing.

2. What is meant by aerial photography & Imageries?

The photographs of the earth taken from aircrafts are called the aerial photographs, while the pictures taken from the satellites are called the imageries.

3. Define aerial photographs.

Aerial photographs of the region are taken by cameras placed in the aircrafts. Aerial photos give three dimension of the photographed area. These photos contain a detailed record of the ground at the time exposure.

4. Define satellite imageries.

The satellite imageries can either be read manually like aerial photographs, or with the help of computers.

5. What is meant by geographic information system?

The modern computers can process maps and data with suitable computer programmer. The process of integrating and analyzing various types of data with the help of computer is known as geographic information system.

6. What are applications of remote sensing?

General geological mapping, mineral prospecting, petroleum exploration, ground
water exploration, engineering .uses of site rocks, disaster studies, coastal geological studies.

7. What are geological considerations involved in the construction of buildings.

Basic requirements of a building foundation, building foundation on soils, building foundation carried to the deep hard rocks, building founded on surface bed rocks, types of settlement in buildings.

8. What are the characteristics of air photos?

Shape and size, flight and photo data, scale.

9. What are the kinds of air photos?

Vertical air photos, oblique air photos, anusaics, photostrips, stereoprain.

10. Define stereo meter.

The instrument is used under a mirror stereoscope for measuring heights and areas of objects from air photos.

11. What is mean by measuring dots?

A stereo meter consists of two small Tran's parent glass or platic plates attached to a long metallic bar. A clear dot is etched on earth of the paltes called "measuring dots".

12. Define land slide.

A land slide is a slow or sudden down hill movement of slope forming rock and soil materials under the force of gravity.

13. Places in which land slide occur.

They occur in hill valley slopes, sea coasts, river banks and bends, on the slopes of volcanic cones and in earth quake prone areas. They also occur under water as on lake or sea floor.

14. What are the classifications of land slides?

Presence or absence of a definite slip plane, materials involved and their water content, kind and rate of movement.

15. What are the parts of atypical slides

Crown, scrap, head, slip plane, flanks, transverse ridges, fool, toe, length, width, height, depth.

16. What are the types of land slides?

(1) Slides:

(2) Falls

(3) Flows

(4) Complex slides.

17. What are the characteristics of land slide?

1, Steep scraps in their upper parts and irregular ridges and furrows at lower parts.

2, Land slides vary in extent from several square meters to several kilometers. It is thickness may several meters.

3,Land slide velocities ranges from very small movement to more than 100 km/h.

18. What are the causes of land sides?

a) Natural causes.

1, Internal factors.

2, External factors.

b) Man induced causes.

19. What are the Geological considerations involved in Road cutting?

a. Topography
b. Lithological characters
c. Structural features of the rocks
d. Ground water conditions

20. What are the structural features of tunnel sites?

a. Dip and strike
b. Folds
c. Faults
d. Joints.

PART-B

1. Discuss in detail various geological conditions necessary in the selection of dam sites
2. What are landslides? Explain in detailed account of the types, causes, geological investigations and remedial for landslides.
3. Describe in detail the destruction work of the sea along coast. Give an account of the different methods of coastal protection.
4. Describe the various application of remote sensing in civil engineering project.
5. Discuss in detail various geological conditions necessary in the selection of tunnels.