



Subject Name: ENGINEERING GEOLOGY

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Year and Sem, Department:

II-YEAR-I SEM-DEPARTMENT OF CIVIL ENGINEERING

Unit-I: (Title)

INTRODUCTION TO BASIC CONCEPTS OF INTRODUCTION AND WEATHERING OF ROCKS

Important points / Definitions: (Minimum 15 to 20 points covering complete topics in that unit)

1. Physical Geology: Physical Geology uses the scientific method to explain natural aspects of the Earth - for example, how mountains form or why oil resources are concentrated in some rocks and not in others.

2. Structural geology: Structural geology is the study of the three-dimensional distribution of rock units with respect to their deformational histories.

3. Weathering of Rocks: Weathering breaks down and loosens the surface minerals of rock so they can be transported away by agents of erosion such as water,

4. Mechanical or physical weathering: involves the breakdown of rocks and soils through direct contact with atmospheric conditions, such as heat, water, ice and pressure

5. chemical weathering: involves the direct effect of atmospheric chemicals or biologically produced chemicals also known as biological weathering in the breakdown of rocks, soils and minerals.

6. goal of structural geology: is to use measurements of present-day rock geometries to uncover information about the history of deformation (strain) in the rocks, and ultimately, to understand the stress field that resulted in the observed strain and geometries.

Short Questions

**UNIT-I
INTRODUCTION AND WEATHERING OF ROCKS**

1. What is mean by engineering geology?
2. Write a short note on Environmental Geology
3. Write a short note about Rock mechanics
4. Write a short note about Geomechanics
5. Distinguish between Mining Geology and Petroleum Geology
6. Define deflation.
7. Write a short note on Pot holes
8. Write a short note on Attrition
9. What is mean by physical weathering?
10. Define denudation.



Long Questions

UNIT-I INTRODUCTION AND WEATHERING OF ROCKS

- Discuss the relationship between the Engineering Geologists and Civil Engineers.
 - Describe the importance of Engineering Geology in Civil Engineering.
- Describe the various branches of Engineering Geology?
- Describe the various branches of Engineering Geology?
- What is meant by “meandering of a river”?
 - Explain the development of a meander with neat sketches.
- Write the importance of physical geology & structural geology.
- What is meant by weathering of rocks? Explain in detail different geological agents responsible for weathering of rocks
- Explain chemical and biological weathering
- Describe the weathering due to air & water in detail.
- Explain physical weathering and frost weathering in detail.
- “The knowledge of geology is very essential at planning stage, design stage and construction stage of any Civil Engineering project”. Justify this statement with a reference to a Dam site selection..

Multiple Choice Questions / Choose the Best: (Minimum 10 to 15 with Answers)

- Which of the following about weathering is not true? (D)
 - It is a natural process
 - Mechanical disintegration is involved
 - Chemical decomposition is involved
 - It is a rapid process
- The process that is not considered under mechanical weathering is _____ (A)
 - Carbonation
 - Temperature variation
 - Unloading
 - Insolation
- What is the change in volume when water freezes? (D)
 - 10% decrease
 - 20% increase
 - 20% decrease
 - 10% increase



4. The form of rock not found by freezing-thawing cycle is _____ (C)
 - a) Angular
 - b) Sub angular
 - c) Spherical
 - d) Irregular
5. The processes by which Scree deposits are formed are (D)
 - a) Chemical attack
 - b) Exposure to sunlight
 - c) Water movement
 - d) Heaving and rolling
6. What are the slopes covered by Scree called? (C)
 - a) Scree slope
 - b) Frost slope
 - c) Talus slope
 - d) Trist slope
7. Where can one find the process of exudation occur?
 - a) Plains
 - b) Seashore
 - c) Hills
 - d) Waterfalls
8. The stress developed in the top layers of the rocks which disintegrate due to repeated variations in temperatures is _____ (B)
 - a) Tensile stress
 - b) Compressive stress
 - c) Shear stress
 - d) Bending stress
9. Which of the following facts about Exfoliation is false? (A)
 - a) It is the phenomenon of peeling off of curved shells from rocks
 - b) The change is accompanied by chemical weathering
 - c) Internal structure of the rock is affected
 - d) It occurs in thick or layered rocks.
10. The large-scale development of fracturing in confined rock masses occurs under which process? (C)
 - a) Frost action
 - b) Unloading
 - c) Unfolding
 - d) Insolation
11. The formation of sheets and subsequently joints occurs in which of the following processes? (C)
 - a) Frost action
 - b) Insolation

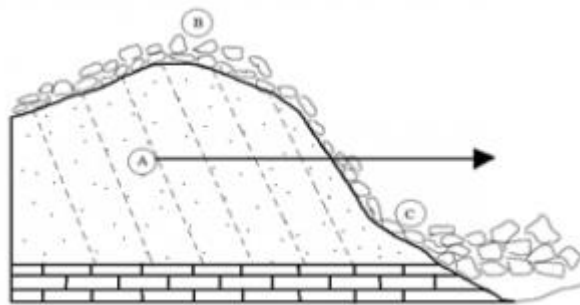


- c) Flow of water
- d) Unloading

12. Scree deposits can occur in hilly regions only. State true or false.(A)

- a) True
- b) False

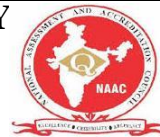
13. Identify the part labelled as “A” in the below diagram.(B)



- a) Weathered rock
- b) Parent rock
- c) Rolled down rock
- d) Powdered rock

14. In Kara Qum desert, the rocks are exposed to what temperatures in summer and winter respectively? (A)

- a) 70-80° C and -10° C
- b) 20-30° C and -1° C
- c) 40-50° C and 0° C
- d) 25-35° C and -3° C



Unit-II: (Title)

Mineralogy & petrology:

Important points / Definitions: (Minimum 15 to 20 points covering complete topics in that unit)

1. Formation of minerals: Minerals are crystalline solid substances, meaning the atoms making up a mineral are arranged in an ordered, three-dimensional, structure

2. Study of minerals: Mineralogy is a subject of geology specializing in the scientific study of chemistry, crystal structure, and physical (including optical) properties of minerals

3. Physical properties:

- The physical characteristics of minerals include traits which are used to identify and describe mineral species. These traits include color, streak, luster, density, hardness, cleavage, fracture, tenacity, and crystal

- Color .Cleavage
- Streak .Fracture
- Luster .Tenacity
- Density .Habit
- Hardness

4. Definition of rock: In geology, **rock** is a naturally occurring solid aggregate of one or more minerals or mineraloids.

5. Crystallization: **Crystallization** is also a chemical solid–liquid separation technique, in which mass transfer of a solute from the liquid solution to a pure solid crystalline phase occurs.

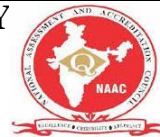
6. Dykes and sills: Dyke” and “sill” are geological terms used to describe an intrusion; usually a mass of igneous or volcanic rocks that forcibly entered, penetrated, and embedded into layers of another rock or land form. Dykes and sills are often.

7. Structure and texture of igneous rocks: The texture of igneous rocks depends on the composition of the magma and the conditions surrounding the magma’s cooling.

The textures are different in intrusive, vein, and extrusive rocks. Intrusive rocks are characterized by

8. Structure and texture of Sedimentary rocks: The relationship between rock structure and texture and rock genesis is more pronounced in sedimentary rocks than in igneous rocks.

Clastic rocks consist of detrital (clastic) grains of various sizes and shapes.



UNIT-II MINERALOGY

1. Mention the composition and properties of Quartz
2. Mention the composition and properties of Feldspars
3. Mention the composition and properties of Mica
4. Mention the composition and properties of Calcite
5. Mention the composition and properties of Kyanite
6. Mention the composition and properties of Chlorite
7. Mention the composition and properties of Talc
8. Mention the composition and properties of Gypsum
9. Mention the composition and properties of Clay Minerals
10. Mention the composition and properties of Bauxite.

Long Questions

UNIT-II MINERALOGY

1. How can you identify a mineral by the help of their physical and chemical properties?
2. Add notes on the following physical characteristics that are useful for the identification of rocks and minerals. (i) Colour (ii) Streak (iii) Hardness (iv) Form
3.
 - a) Define Mineral. How are the minerals classified?
 - b) Explain the physical properties of the following minerals.
Feldspar ii. Hornblende iii. Talc iv. Biotite
4. Explain the significance of different Physical properties in mineral identification.
5. On the basis of silicate structure, classify silicate minerals into various groups. Explain the structure of each group in detail.
6. Discuss thoroughly about the structures of Igneous Rocks. (Illustrate your answer with neat diagrammatic sketches)
7. With the help of neat diagrammatic sketches, describe briefly on Primary Sedimentary Structures.
8. Differentiate between
 1. Sandstone and Shale
 2. Shale and LimestoneConglomerate and Breccia.
9. Describe the different types of rocks. Give the classification, texture and structure of igneous, sedimentary and metamorphic rocks.
10. Differentiate between:
 - (i) Quartzite and Marble
 - (ii) Gneiss and SchistGneiss and Slate



Multiple Choice Questions / Choose the Best: (Minimum 10 to 15 with Answers)

1. The property of a mineral by virtue of which it can be cut with a knife is (B)
 - a) Parting
 - b) Sectile
 - c) Malleable
 - d) Ductile
2. Mica is (C)
 - a) Flexible
 - b) Rigid
 - c) Flexible and elastic
 - d) Elastic
3. When the mineral occurs in flattened or square form, it is called (A)
 - a) Tabular
 - b) Elongated
 - c) Batroidal
 - d) Box
4. Example for elongated structure is (B)
 - a) Calcite
 - b) Beryl
 - c) Orthoclase
 - d) Barite
5. Kyanite shows which form? :(C)
 - a) Columnar
 - b) Elongated
 - c) Bladed
 - d) Tabular
6. Structure or form which depicts leaf-like sheets is (B)
 - a) Foliated
 - b) Lamellar
 - c) Radiating
 - d) Granular
7. Muscovite mica shows which structure? (B)
 - a) Lamellar
 - b) Foliated
 - c) Fibrous
 - d) Radiating
8. Identify the type of structure shown below. (C)
 - a) Lamellar
 - b) Foliated
 - c) Radiating
 - d) Granular



9. Chromite shows which type of structure? (A)

- a) Granular
- b) Globular
- c) Reniform
- d) Mammillary

10. Which form resembles human kidney? (B)

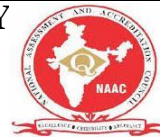
- a) Globular
- b) Reniform
- c) Granular
- d) Mammillary

11. Malachite shows which type of structure? (C)

- a) Reniform
- b) Globular
- c) Mammillary
- d) Granular

12. The SI unit of specific gravity is (D)

- a) Ohm
- b) g/cc
- d) N/cc
- d) No unit



Unit-III: (Title)

STRUCTURAL GEOLOGY AND GROUND WATER

Important points / Definitions: (Minimum 15 to 20 points covering complete topics in that unit)

1. Lithology: The **lithology** of a rock unit is a description of its physical characteristics visible at outcrop, in hand or core samples or with low magnification microscopy, such as colour, texture, grain size, or composition.
2. Biostratigraphy:**Biostratigraphy** is the branch of stratigraphy which focuses on correlating and assigning relative ages of rock strata by using the fossil assemblages contained within them.
3. Out crop:An outcrop or rocky outcrop is a visible exposure of bedrock or ancient superficial deposits on the surface of the Earth
4. Strike :Strike is a geographic direction given by the line of intersection of a horizontal plane with a bedding plane of a layer of rock.
5. Dip:It is defined as the max angle of inclination with the horizontal. It is expressed both in terms of degree of inclination and direction of inclination.
6. True Dip:when the dip of the layer is measured in a direction that is essentially at right angles to the strike of the particular layer, then It is called TRUE DIP.
7. Apparent Dip:When the dip of the layer is measured in any other direction which is not a right angles to the strike direction is called APPARENT DIP.
8. **Folds** are one of the most common geological structures found in rocks. When a set of horizontal layers are subjected to compressive forces, they bend either upwards or downwards.
9. **Groundwater** (or **ground water**) is the water present beneath Earth's surface in soil pore spaces and in the fractures of rock formations.
10. SPRINGS:A spring is the result of an aquifer being filled to the point that the water overflows onto the land surface.
11. Types of springs:
 - Seepage or filtration spring. The term seep refers to springs with small flow rates in which the source water has filtered through permeable earth.
 - Fracture springs, discharge from faults, joints, or fissures in the earth, in which springs have followed a natural course of voids or weaknesses in



the bedrock.

12.CONE OF DEPRESSION:

- A **cone of depression** occurs in from a an aquifer when groundwater is pumped aquifer well. In an unconfined depression of the (water table), this is an actual water levels.
- In confined aquifers (artesian), the cone of depression is a reduction in the pressure head surrounding the pumped well.

13.What is an aquifer???

An **aquifer** is an underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, or silt) from which groundwater can be extracted using a water well.

14.Confined aquifer(artesian) :-

- Confined aquifers are those in which an impermeable dirt/rock layer exists that prevents water from seeping into the aquifer from the ground surface located directly above.

15.Unconfined aquifer (water table aquifer):-

- **Unconfined aquifers** are those into which water seeps from the ground surface directly above the **aquifer**.

16.Unconfined aquifers:

- Natural recharge of the unconfined aquifers is mainly due to the downward seepage (or percolation) through the unsaturated zone of the excess water over passing the field capacity of the soil. Recharge can also occur through upward seepage (leakage) from underlying aquifers.

17.Confined aquifers:

- A regional confined aquifer is directly recharged by precipitation in the area where the aquifer crops out, having the same characteristics as an unconfined aquifer.



**UNIT-III
STRUCTURAL GEOLOGY**

1. Write briefly regarding Unconformities
Define following
2. Disconformity
3. Non conformity
4. Unloading joints
5. Cooling joints
6. Folds
7. Columnar joints
8. Angular unconformity
9. Radial faults
10. Joints due to the regional deformation

Long Questions

UNIT-III STRUCTURAL GEOLOGY

1. Explain briefly a. Fold b. Fault c. Joint. (Illustrate your answer with neat diagrammatic sketches)
2. Write about Geological controls on Groundwater Movement.
3. Explain the following investigations to be carried out in ground water Exploration:
(i) Geological Investigations
(ii) Geophysical Investigations
(C) Hydrological investigations.
3. Discuss, in brief, the causes and effects of earthquakes. In this connection enumerate some of the major Indian earthquakes and comment on the possible mode of origin.
4. What is a water table and what are the types of ground water which occurs in the zone of aeration and saturation.
5. What is a water table and what are the types of ground water which occurs in the zone of aeration and saturation.
6. Discuss thoroughly about the Dip strike, unconformity and drag fold.
7. Discuss the various Groundwater movements
8. What is a fault? Discuss the various types of faults and write about the engineering applications.
(Or)
What is a fold? Discuss the various types of faults and write about the engineering applications.
(Or)
What is a joint? Discuss the various types of faults and write about the engineering applications.
9. Write an essay on Classification and Causes of Earthquakes? Describe the Civil Engineering Considerations in Seismic Areas with reference to building Construction.
10. Write in detail about landslides and their causative effects. Explain about the measures to prevent them



Multiple Choice Questions / **Choose the Best: (Minimum 10 to 15 with Answers)**

1. What are the undulations or bends developed in rocks called? (C)
 - a) Faults
 - b) Joints
 - c) Folds
 - d) Uncomformity
2. Folds develop in which type of rock (D)
 - a) Igneous rock
 - b) Sedimentary rock
 - c) Metamorphic rock
 - d) Any type of rock
3. Which type of deformation is folding? (B)
 - a) Brittle
 - b) Ductile
 - c) Tensile
 - d) Malleable
4. Folding is _____ process (A)
 - a) Very slow
 - b) Rapid
 - c) Quick
 - d) Moderate rate
5. Which among the following is not a part of fold? (D)
 - a) Limbs
 - b) Hinge
 - c) Axis of fold
 - d) Height of fold
6. The minimum number of limbs for a fold are (B)
 - a) 1
 - b) 2
 - c) 3
 - d) 4
7. The point where the curvature is maximum is _____ (A)
 - a) Hinge
 - b) Axial surface
 - c) Nucleus
 - d) Fold point
8. When the plunge said to be zero, then the axis of the fold is said to be (B)
 - a) Vertical
 - b) Horizontal
 - c) Inclined at 60° to the horizontal
 - d) Inclined at 60° to its normal.



9. The crest and trough may or may not coincide with the axis. State true or false. (A)

- a) True
- b) False

10. What is axis of a fold? (C)

- a) Line drawn normal to the hinge line
- b) Line drawn at 60° to hinge line
- c) Line drawn parallel to hinge line
- d) Line which doesn't pass through hinge line.

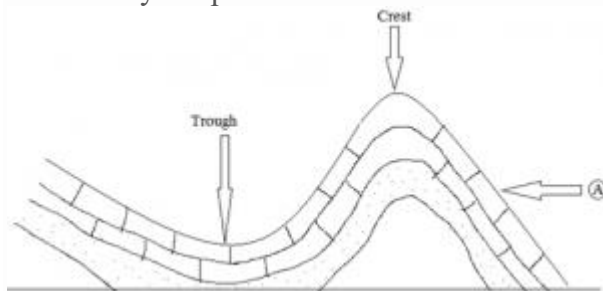
11. How is the plunge of a fold measured? (D)

- a) Direction
- b) Degree
- c) Depth
- d) Both direction and degree

12. An axial plane can be vertical, inclined or horizontal in nature. State true or false.(B)

- a) False
- b) True

13. Identify the part labelled "A" in the below figure. (A)



- a) Limb
- b) Hinge
- c) Axis of fold
- d) Plunge

14. Which of the following about axial plane is not true. (D)

- a) Axial plane is imaginary
- b) Axial plane may be vertical, inclined or horizontal
- c) Axial plane may be planar or non-planar
- d) Axial plane need not pass through all points of maximum curvature in a folded sequence

15. In which rock, joints may be classified on the basis of their lineation?

- a) Sedimentary
- b) Igneous
- c) Metamorphic
- d) Igneous and metamorphic

Answer: d

Explanation: In igneous and metamorphic rocks, the joints may be classified on the basis of their geometric relations with planar structures of those rocks such as lineation or cleavage.

16. Joints traverse linear structure right angles in which type?

- a) Q joints



- b) S joints
- c) B joints
- d) T joints

Answer: a

Explanation: Cross or Q joints are the joints which are traversing the linear structures at right angles.

17 Which are the joints parallel to linear structure? (B)

- a) Cross joints
- b) Longitudinal joints
- c) Alternate joints
- d) Q joints

18.The joints developed due to tensile forces are (A)

- a) Tensile joints
- b) Compressive joints
- c) Shear joints
- d) No particular name

19. The type of joint occurring in igneous rocks during cooling is (B)

- a) Shear joints
- b) Tensile joints
- c) Compression joints
- d) Bend joints

20. Which joints are located in axial regions in the folded rocks? (C)

- a) Tension joints
- b) Compression joints
- c) Shear joints
- d) T joints



Unit-IV: (Title)

GEOLOGY OF DAMS AND RESERVOIRS

Important points / Definitions: (Minimum 15 to 20 points covering complete topics in that unit)

1.EARTH QUAKE DEFINITION:

- A sudden violent shaking of the ground, typically causing great destruction, as a result of movements within the earth's crust or volcanic action.
- A sudden release of energy in the earth's crust or upper mantle, usually caused by movement along a fault plane or by volcanic activity and resulting in the generation of seismic waves which can be destructive.

2.Seismic Waves

- **Seismic waves** are **waves** of energy that travel through the Earth's layers, and are a result of an **earthquake**, explosion, or a volcano that gives out low-frequency acoustic energy.

3. Primary waves (P-wave):

- Primary waves are compressional waves that are longitudinal in nature. P waves are pressure waves that travel faster than other waves through the earth to arrive at seismograph stations first, hence the name "Primary".

4. Secondary waves(S-Waves):

- Secondary waves (S-waves) are shear waves that are transverse in nature. Following an earthquake event, S-waves arrive at seismograph stations after the faster-moving P-waves.

5. RICHTER SCALE:

- The **Richter magnitude scale** (also **Richter scale**) assigns a magnitude number to quantify the energy released by an earthquake

6. BASICS OF A DAM:

- In a way ,the success of dam is not only related to its own safety and stability but also depends on the success of associated reservoirs.

7. BEDROCK AT SHALLOW DEPTH

- To ensure the stability and safety of a dam, the dam has to rest on very strong and very stable rocks(i.e bedrock).



8. BENEFITS OF DAMS

1. Power generation
2. Water supply
3. Stabilize water flow / irrigation
4. Flood prevention
5. Land reclamation
6. Recreation and aquatic beauty
7. Navigation

9. DISADVANTAGES OF DAMS

1. Seepage and evaporation
2. Groundwater table effects
3. Sedimentation behind dams
4. Erosion downstream by sediment-starved waters

10. RESERVOIR

The dams constructed across the rivers create artificial lakes which are known as reservoirs.

11. LANDSLIDES

If a mass of earth or rock moves along a definite zone or surface the failure is called as Landslide.

12. TSUNAMI

1. A Tsunami is a giant wave (or series of waves) created by an undersea earthquake, volcanic eruption and landslide.
2. Tsunamis are often called as tidal waves but this is not accurate description because tides have little effect on giant tsunami waves.

13. VOLCANOES

A Volcano is a vent (hole) in the earth's crust through which lava, steam, ashes and etc., are expelled.



14.AVALANCHES

1. An Avalanche is any amount of snow sliding down a mountainside.
2. Another term for avalanche is snow slide.

15.FLOODS

A Flood is an overflow of water that submerges the land which is usually dry.

16.GEOLOGICAL FACTORS EFFECTING WATERTIGHTNESS **CONTENTS:**

1. Water tightness introduction
2. Factors affecting water tightness
3. Factors affecting life of a reservoir

17.WATER TIGHTNESS:

Water at the site of reservoir and dam tends to percolate to underground through fractures and voids, this leakage may results in decrease in water level at reservoir so a reservoir must be made with sufficient water tightness.

18. BURIED RIVER CHANNEL:

This is generally present as a glaciers below the surfaces it may not decrease the water tightness.

19. ELECTRICAL METHODS

- Electro resistivity method.
- Electromagnetic method.
- Self potential method.

20 .ELECTRO RESISTIVITY METHOD:

- The formation of electrical resistivities of sub-surface differ from one another if they are homogenous.
- These resistivities are studied by means of resistivity method.
- They are two types of resistivity investigations



1) Profiling

2) Sounding

21.ELECTRO MAGNETIC METHOD :

In the principles of electromagnetic field an alternating magnetic field is formed in ground with help of an appropriate source. The formed electromagnetic field induces eddy currents in conductive ore bodies in sub-surface and these produces secondary electromagnetic fields. The magnetic element of secondary electromagnetic field is examined at surface to find underground ore deposits.

22. DAMS: Dam is a solid barrier constructed at a suitable location across a river valley to store flowing water and used

23.TYPES OF DAMS

There are four types of dams. They are

- Arch dam
- Gravity dam
- Buttress dam
- Earth dam

24.ARCH DAM:

- This type of dams are concrete dams which are curved or convex upstream in plan. It is dependent upon the arch action for its strength.

25.GRAVITY DAM

- Gravity dams are the dams which resist the horizontal thrust of water entirely by their own weight

26.BUTTRESS DAM

- Buttress dams are dams in which the face is held up by a series of supports.

27.EARTH DAMS

- Earth dams are trapezoidal in shape
- Earth dams are constructed where the foundation rocks are weak to support

28.Seismic Waves



- **Seismic waves** are **waves** of energy that travel through the Earth's layers, and are a result of an **earthquake**, explosion, or a volcano that gives out low-frequency acoustic energy.

29. RICHETER SCALE:

The **Richter magnitude scale** (also **Richter scale**) assigns a magnitude number to quantify the energy released by an earthquake.

UNIT-IV GEOLOGY OF DAMS AND RESERVOIRS

1. Seismic methods.
2. Geothermal methods.
3. Gravity methods.
4. Grating methods
5. Geothermal methods.
6. Brief on the structure of dam with a neat sketch.
7. Gravity dams.
8. Buttress dams.
9. Arch dams.
10. Earth dams.

Long Questions

UNIT-IV GEOLOGY OF DAMS AND RESERVOIRS

1. What are the Geological Considerations necessary in the selection of a Dam Site?
2. Discuss the foundation and abutment competency of rocks with reference to dams.
3. Explain the geological Causes for the Failure of Dams, with a few Case Histories
Explain the geological factors influencing water tightness and life of
4. reservoirs and write a short note on geological considerations in the leakage of reservoirs.
5. Discuss the influence of Geological Structures over Dams.
6. Explain the considerations of different types of rocks at the dam site construction.
7. Explain in detail the role of electrical methods of subsurface investigation in civil engineering practice.
8. Explain the following Geophysical methods.
(a) Seismic methods. (b) Geothermal methods.
9. Describe the principle of gravity method with the help of a neat sketch. What are the different parameters measured? Also explain different kinds of gravity methods that are followed during the investigations.
10. Write about the various electrical conductivity and resistivity methods



Multiple Choice Questions / **Choose the Best: (Minimum 10 to 15 with Answers)**

1. A solid barrier constructed at a suitable location across a river valley to impound water is called (B)
 - a) Reservoir
 - b) Dam
 - c) Bridge
 - d) Retaining wall
2. Which among the following is not an objective for the construction of dam? (A)
 - a) To make sure rains occur periodically
 - b) Generation of hydropower energy
 - c) Providing water supply for domestic and industrial purposes
 - d) Providing irrigational facilities
3. The criteria to classify a dam as a large dam is (D)
 - a) Length of the crest of the dam lesser than 500 m
 - b) Capacity of the reservoir less than 1 million cubic meters
 - c) Maximum flood discharge less than 2000 cubic meters/second
 - d) Capacity of the reservoir not less than 1 million cubic meters
4. Which state in India has most number of large dams? (C)
 - a) Karnataka
 - b) Orissa
 - c) Maharashtra
 - d) Madhya Pradesh
5. Which is the longest dam in India? (A)
 - a) Hirakud dam
 - b) Bhakra dam
 - c) Krishnarajasagar dam
 - d) Nagarjun sagar dam
6. Which is the tallest dam in India? (B)
 - a) Hirakud dam
 - b) Bhakra dam
 - c) Krishnarajasagar dam
 - d) Nagarjun sagar dam
7. Which type of dam usually has triangular profile and can resist the forces by its own weight? (A)
 - a) Gravity dam
 - b) Arch dam
 - c) Geotechnical dam
 - d) Embankment dam
8. What is very critical about gravity dams? (C)
 - a) Strength of the concrete used
 - b) Strength of the masonry used
 - c) Strength of the rock foundation
 - d) The type of water stored in the reservoir



9. State true or false. The upstream face of a gravity dam is always vertical.(B)

- a) True
- b) False

10. Type of dam where the forces acting on the dam are transmitted onto the abutment rocks is (B)

- a) Gravity dam
- b) Arch dam
- c) Geotechnical dam
- d) Embankment dam

11. Which type of dam cannot be constructed even on the rock foundations which are not sufficiently strong enough? (A)

- a) Gravity dam
- b) Arch dam
- c) Geotechnical dam
- d) Embankment dam



Unit-v: (Title)

TUNNELS

Important points / Definitions: (Minimum 15 to 20 points covering complete topics in that unit)

1. **PURPOSE OF TUNNELING:**A Tunnel is an underground passage. In general, tunnels are at least twice as long as they are wide and are completely enclosed on all sides, save for the openings at each end
2. **Utility ducts:** Utility ducts are man-made tunnels created to carry two or more utility lines underground. Through co-location of different utilities in one tunnel, governments and companies are able to reduce the costs of building and maintaining utilities.
3. "tunnel effect", when talking about long stretches of road, refers to the environment surrounding the driver that begins to merge towards the central point of the horizon. This effect can be noted at high speeds, when driving on straight smooth roads. The effect is amplified if the environment surrounding is monotonous
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4. Overbreak :of rock beyond the designed periphery of a tunnel is a structural risk which more than occasionally results in filing of a claim by the contractor. It is difficult to estimate the overbreak risk at the time of tender with sufficient degree of accuracy because of the uncertainty associated with the geology, construction technique, and the interaction of these two domains

**UNIT-V
TUNNELS**

1. Purposes of tunneling.
2. Lining of tunnels.
3. Over break.
4. Different purposes of tunnels
5. Tunnels faulted strata
6. Tunnels in folded strata
7. Tunnels in Faulted formations
8. Write the importance of ground water condition
9. What are mining substances
10. Define folds and faults



Long Questions

UNIT-V TUNNELS

1. What is a tunnel? Explain the terms that are used in tunnels with neat sketches. Also explain the purpose of tunneling.
2.
 - a) .Mention the deteriorating effects produced in the ground during the excavation of tunnels.
 - b) Mention the variety of purposes served by tunnels.
3. What is the role of lithology and geological structures in successful tunneling?
4. Write a short notes on a) effects of tunneling on the ground and b) Over break
5. What is meant by lining in tunnels? Discuss the lithological and structural reasons that necessitate lining.
6. What are the various geological factors to be considered for the construction of tunnels? Explain in detail with examples.
7. Explain how the study of bed rocks is essential before the construction of tunnels.

Multiple Choice Questions / Choose the Best: (Minimum 10 to 15 with Answers)

1. The underground routes or passages driven through the ground without disturbing overlying soil cover are called (C)
 - a) Bridges
 - b) Passages
 - c) Tunnels
 - d) Sub-routes
2. Type of tunnels which are excavated to divert the traffic load of whatsoever type from surface to subsurface routes. (A)
 - a) Traffic tunnels
 - b) Hydropower tunnels
 - c) Public utility tunnels
 - d) Delivery tunnels
3. Pick the tunnel which is not a sub-group of traffic tunnels.(B)
 - a) Railway tunnels
 - b) Sewage tunnels
 - c) Highway tunnels
 - d) Pedestrian tunnels
4. Tunnels associated with hydropower generation are called (D)
 - a) Energy tunnels
 - b) Power tunnels
 - c) Generation tunnels
 - d) Hydropower tunnels



5. Type of hydropower tunnel where water is conveyed under gravity is (A)
- a) Discharge tunnel
 - b) Pressure tunnel
 - c) Supply tunnel
 - d) Delivery tunnel
6. Type of hydropower tunnel where water is conveyed under high pressure to turbines is (B)
- a) Discharge tunnel
 - b) Pressure tunnel
 - c) Supply tunnel
 - d) Delivery tunnel
7. Underground excavations for carrying pipes, sewage etc. fall under which type?(C)
- a) Traffic tunnels
 - b) Hydropower tunnels
 - c) Public utility tunnels
 - d) Delivery tunnels
8. Subway and tube railways are studied under which type of tunnels? (C)
- a) Traffic tunnels
 - b) Hydropower tunnels
 - c) Public utility tunnels
 - d) Delivery tunnels
9. Method of placing tubes in public utility tunnels is called (D)
- a) Covering method
 - b) Digging method
 - c) Slash and cover method
 - d) Cut and cover method
10. Geologically, how many classes of tunnels are recognized? (A)
- a) 2
 - b) 3
 - c) 5
 - d) 4
11. Traffic tunnels are always constructed for kilometres. State true or false. (B)
- a) True
 - b) False



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