

B.E CIVIL ENGINEERING EXAMINATION, 2023**(2nd Year, 1st Semester)****Subject: Engineering Geology****Time: Three hours****Full Marks: 100****(50 marks for each group)****Use a separate Answer-Script for each group****GROUP – A****Answer any five (05) questions from the following:**

1. What are the major stages of a large civil engineering project? On which stage, the knowledge of 'Engineering Geology' is most relevant and how? Discuss the importance of Topographical and Geohydrological during planning stage of civil construction project. **(2+4+4)**

2. What is ground water table? How it forms in substrata? Explain, why the depth of ground water table fluctuates temporally and spatially? What is capillary fringe? With proper sketch distinguish between confined and unconfined aquifer. **(2+3+2+3)**

3. Mention the Darcy's law, relevant to flow of a liquid through porous media. What are the assumptions to be taken to apply this law?
A field sample of unconfined aquifer is packed in a test cylinder. The length and the diameter of the cylinder are 60 cm and 8 cm respectively. The field sample tested for a time period of 4 minutes under a constant head difference of 17.5 cm. As a result 47.4 cm³ of water is collected at the outlet. Determine the hydraulic conductivity of the aquifer sample (in cm/minute). **(2+3+5)**

4. **Distinguish between:** **(2.5×4)**

- Effluent and Influent condition of a natural stream flow
- Confined and Unconfined aquifer
- Vadose zone and Phreatic zone
- Discharge & Seepage velocity

5. Prove that $e = \frac{G_s \times \gamma_w}{\gamma_d} - 1$, where saturation, e = void ratio, γ_w = unit weight of water, γ_d = dry unit weight of the soil, G_s = specific gravity of the solid mass of the soil or rock.

A soil sample in its undisturbed state was found to have volume of 100 cm³ and weight of 230 gm. After oven drying the weight got reduces to 180 gm. Compute (a) the water content, (b) Dry density (c) Void ratio, (d) Porosity, Assume $G_s = 2.7$. **(5+5)**

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6. Choose the correct answer from the following:

(write the option no. and full text of the answer)

- (i) 'Lithosphere' consists of
- The lower part of earth crust and the upper part of the mantle
 - The lower part of the mantle and the upper part of the core
 - From upper to lower part of the crust
 - Entire earth crust and upper part of mantle
- (ii) The percentage of fresh water available as subsurface ground water is about
- 1.61%
 - 61.0%
 - 0.61%
 - 0.81%
- (iii) The most widely spread rock type on the surface of the Earth is the
- Metamorphic rocks
 - Igneous rocks
 - Sedimentary rocks
 - Humus
- (iv) Bulk density of the soil generally denotes
- Density of soil when all its pores filled up with water.
 - Natural density of the soil in-situ condition
 - Density of solid part of the soil
 - Soil density measured after compaction
- (v) Soil sample with a weight of W , having the weight of its solids is W_s . The water content of the sample is w , then
- $W = \frac{W_s}{1+w}$
 - $W = \frac{W_s}{1+w}$
 - $W = \frac{1-W_s}{1-w}$
 - $W_s = \frac{W}{1+w}$
- (vi) The unit dimension of 'coefficient of permeability' is same as the unit of
- Length
 - Area
 - Velocity
 - Volume

- (vii) Out of the following, which is not a significant contributing system to the Hydrologic cycle?
- Pedosphere
 - Atmosphere
 - Biosphere
 - Lithosphere
- (viii) Kolkata, city of West Bengal, India, is located within the Earthquake zone of
- Zone III
 - Zone IV
 - Zone I
 - Zone II
- (ix) Liquefaction of soil is triggered by
- Sudden seismic shock in dry granular soil in arid region
 - Could bursting in residual soil in hilly terrain
 - Rapid super saturation of fine grained cohesive soil
 - Excess rate of runoff in a steep hill slope with low vegetation
- (x) Generally time span needed to complete a full cycle rotation of Hydrologic Cycle is about
- 15 to 20 days
 - 15 to 20 years
 - 150 to 200 years
 - 15000 to 20000 years

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Bachelor of Engineering Civil Engineering
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GROUP – B

Answer Questions 1 and 2 and any Seven from the rest.

Q1. Write “True” or “False”:

(10)

- i. Block Mountains are tectonic mountains.
- ii. Ore minerals have lower specific gravity than the non-metallic minerals.
- iii. An interfacial angle is an external angle between two adjoining faces.
- iv. Plutonic rocks are always formed from the cooling of magma just below the surface of the earth.
- v. Tillite is a sedimentary rock of glacial origin.
- vi. The Mohorovicic discontinuity demarcates the crust from the mantle.
- vii. Carbonation is the action of carbon dioxide on the limestone rock.
- viii. Incised meanders develop in flood plain areas of mature rivers.
- ix. Atolls are the caves formed by the solvent action of ground water.
- x. Glaciers are downward moving bodies of pure snow.

Q2. Match the following: (5)

- | | |
|------------------|-----------------|
| (a) Blind Valley | 1. Sea Water |
| (b) Tombola | 2. River Water |
| (c) Cirques | 3. Ground Water |
| (d) Slack | 4. Glacier |
| (e) Waterfalls | 5. Wind |

Q3. What are the most important characters which can help in mineral identification? Discuss any four such features with examples (1+4=5)

Q4. What is a volcano? Explain the three stages of volcanoes with suitable examples. (1+4=5)

Q5. Discuss briefly the principles behind the geologic time scale of our Earth (5)

Q6. Describe with the help of neat sketches, the process of erosion caused by glaciers. (5)

Q7. Explain briefly some major geological features produced by wind on the land surface due to deposition. (5)

Q8. Explain classification of sedimentary rocks giving suitable examples (5)

Q9. Discuss the Role of Geological Investigations in Engineering Practice. (5)

Q10. Write short notes (any one) (5)

(a) Moh's scale of hardness

(b) Radioactivity