B. Sc. GEOLOGICAL SCIENCE EXAMINATION, 2024

(3rd Year, 1st Semester)

HYDROGEOLOGY

PAPER : CORE 11

Time : *Two Hours* *Full Marks* : 40

(*Use a separate Answer script for each Part*)

PART—I (20 Marks)

Answer *any four* questions from the following : 5×4=20

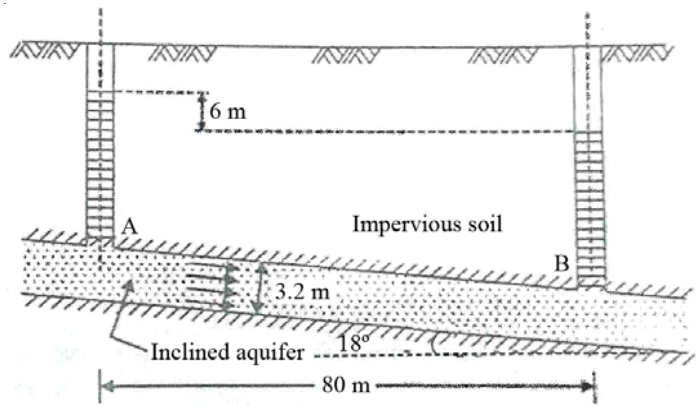
1. What is interflow? How does it differ from surface runoff? Why, in the monsoon months, interflow is significantly high at hilly regions? 1+2+2

2. How does the permeability of an aquifer change with the 'grading and sorting' characteristics of its constituent particulate materials? What is absolute permeability? Derive the unit dimension of 'absolute permeability' by dimensional analysis. 2+1+2

3. How does the 'Hydraulic Gradient' of a porous change with its inclination?

Figure, as shown below, is of an inclined aquifer. Two observation wells, dug up to the aquifer at a horizontal distance of 80 m, show a difference of 6 m in the water levels. Taking

the coefficient of permeability of aquifer material as 1·2 mm/sec, determine the discharge through the aquifer, per unit width. The thickness of the aquifer normal to the flow direction is 3·2 m and the angle of inclination is 18°. 1+4



4. How do the components of velocity vectors of ground water flow change with the subsurface depth?

An aquifer is 2040 m wide and 26 m high in cross-section. Its hydraulic gradient is 0·05 and hydraulic conductivity is 142 m/day. Calculate the velocity of the groundwater as well as the volume of the water that passes through the cross-sectional area of the aquifer in a day, if the porosity of the aquifer is 34%. 2+3

5. Distinguish between : 2½×2=5

(a) Discharge velocity and Seepage velocity

(b) Water stress index and Water footprint

PART—II (20 Marks)

Answer Question No. 1 and *any two* from the rest :

1. Write short notes on : 2×2=4

(a) Darcy's law

(b) Piper trilinear diagram

2. *(a)* What do you mean by 'confined', 'unconfined' and 'artesian' aquifers?

(b) How do you distinguish between 'Piezometric surface' and 'Water table'?

(c) How do you define 'Hydraulic head' and 'Hydraulic gradient' of an aquifer? 3+2+3

3. *(a)* How do you distinguish between 'Specific Yield' and 'Specific Retention'? How are they related to the porosity of an aquifer?

(b) How do you distinguish among 'Aquiclude', 'Aquifuge' and 'Aquitard'?

(c) What is Recharge zone? 3+3+2

4. *(a)* What is 'Cone of Depression'?

(b) What do you mean by 'Transmissivity' and 'Storativity' of an aquifer?

(c) Give the names of arsenic bearing minerals. What are the release mechanisms of arsenic in groundwater? 2+3+3

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