

- (c) If groundwater samples plot predominantly within the calcium-bicarbonate (Ca-HCO_3) field of a Piper diagram, what does this suggest regarding the underlying hydrogeochemical processes ? 4
7. (a) Provide an overview of the steps and techniques involved in groundwater exploration. 12
- (b) Discuss the concept of recharge and discharge area. How are they identified ? 6
8. What is the Ghyben-Herzberg relation between fresh and saline water ? List the assumption implied in the relation. What are some of the causes of saline water intrusion into coastal aquifers ? Suggest some remedies to control saline water intrusion. 18

[This question paper contains 4 printed pages]

Your Roll No. :**Sl. No. of Q. Paper** : **5591** **I**

Unique Paper Code : 2192012402

Name of the Paper : Hydrogeology

Name of the Course : **B.Sc.(H) Geology, II Year**

Semester : IV

Time : 3 Hours **Maximum Marks : 90****Instructions for Candidates :**

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
- (b) **All** questions carry equal marks. Attempt any **five** questions.

1. Write short notes on the following : 6×3=18

- (a) Static water level, drawdown and cone of depression
- (b) Saline water upconing
- (c) Piezometric Surface

- (d) Anisotropy and heterogeneity in aquifers
 - (e) Sodium Adsorption Ratio (SAR)
 - (f) Equilibrium and non-equilibrium groundwater flow condition
2. Describe the key components and processes of the hydrological cycle. Discuss the impacts of anthropogenic activities and climate change on the cycle, with particular emphasis on the groundwater component. Support your explanation with clear, schematic diagrams. 18
3. (a) Describe the vertical zonation of subsurface water. Discuss how these zones influence the distribution and availability of groundwater. 9
- (b) Discuss about the governing equation for water flow to a well in a confined aquifer under equilibrium condition. 9
4. Differentiate between (any **three**) $6 \times 3 = 18$
- (a) Storage Coefficient and Specific Storage
 - (b) Intrinsic permeability and Hydraulic Conductivity

- (c) Porosity and Permeability
 - (d) Influent and effluent conditions in the context of surface water-groundwater interaction
5. (a) Discuss about groundwater flow rate in context of Darcy's Law. What are the field parameters required for this computation? 8
- (b) Explain the procedure for determining the direction of groundwater flow in an aquifer. 6
- (c) Given a groundwater contour map where water table elevations decrease from north to south, discuss the likely contaminant transport pathways. 4
6. (a) Briefly explain the key physical and chemical parameters in assessing groundwater quality. 7
- (b) Describe Hill-Piper diagram used in the classification of groundwater types. Highlight the advantages of this graphical method in hydrogeochemical analysis and the interpretation of groundwater chemistry data. 7