

GUJARAT TECHNOLOGICAL UNIVERSITY

5 SEMESTER – OLD PAPER – S22 TO W25 – QUESTION BANK

Subject Name & Code: Groundwater Hydrology and Contamination - 3151311

Chapter 1: Introduction

Repeated Questions:

1. Groundwater, Hydrologic Cycle and Basic Terms:

- **Q.** Explain with neat sketch groundwater in Hydrologic cycle / Illustrate and explain groundwater system in Hydrologic cycle with neat sketch. [Diagram required – refer to the original question paper] (**SUMMER 2022, 7 Marks; WINTER 2022, 7 Marks OR; WINTER 2023, 7 Marks; SUMMER 2024, 4 Marks; SUMMER 2025, 7 Marks; WINTER 2025, 7 Marks OR**)
- **Q.** Discuss vertical distribution of groundwater with neat sketch. [Diagram required – refer to the original question paper] (**WINTER 2022, 4 Marks; SUMMER 2023, 7 Marks; SUMMER 2024, 4 Marks; WINTER 2024; SUMMER 2025, 7 Marks; WINTER 2025, 4 Marks**)
- **Q.** Differentiate between Groundwater and Surface water / Tabulate key differences between Surface water and Groundwater. (**SUMMER 2022, 4 Marks; WINTER 2022, 4 Marks; SUMMER 2023, 4 Marks; SUMMER 2024, 4 Marks; SUMMER 2025, 4 Marks; WINTER 2025, 4 Marks**)
- **Q.** Write the assumptions made in Dupuit's theory. (**SUMMER 2022, 3 Marks; WINTER 2022, 4 Marks OR; SUMMER 2023, 3 Marks; WINTER 2023, 4 Marks; WINTER 2024, 3 Marks OR; SUMMER 2025, 4 Marks**)
- **Q.** What do you mean by Ground water table? (**SUMMER 2022, 3 Marks; WINTER 2023, 3 Marks**)
- **Q.** What do you mean by Infiltration? (**WINTER 2022, 3 Marks; SUMMER 2025, 3 Marks**)
- **Q.** Give classification of Groundwater. (**SUMMER 2024, 4 Marks OR; WINTER 2025, 4 Marks**)

2. Aquifers and Aquifer Types:

- **Q.** Differentiate between aquifer, aquiclude, aquitard and aquifuge / Compare in tabular form Aquifer, Aquiclude, Aquifuge & Aquitard with distinguishing parameters / Explain with sketch the term Aquiclude, Aquifuge & Aquitard. [Diagram required – refer to the original question paper] (**SUMMER 2022, 4 Marks OR; SUMMER 2024, 4 Marks; SUMMER 2025, 7 Marks; WINTER 2025, 7 Marks**)
- **Q.** What is Aquifer? / Explain with sketch the term Aquifer and give its classification. [Diagram required – refer to the original question paper] (**SUMMER 2024, 3 Marks; SUMMER 2025, 4 Marks**)
- **Q.** What do you mean by Perched aquifer? / Explain with sketch the term Perched Aquifer. [Diagram required – refer to the original question paper] (**SUMMER 2022, 3 Marks OR; WINTER 2023, 3 Marks; WINTER 2024, 3 Marks; WINTER 2025, 4 Marks OR**)
- **Q.** What do you mean by Leaky aquifer? (**WINTER 2023, 3 Marks OR; WINTER 2024, 3 Marks OR**)

3. Hydrologic Properties of Water-Bearing Strata:

- **Q.** Define/explain Porosity, Permeability and Transmissibility. (**WINTER 2022, 3 Marks; SUMMER 2023, 3 Marks OR; SUMMER 2024, 3 Marks; WINTER 2024; WINTER 2025, 3 Marks OR**)
- **Q.** Define Void ratio for soil / What do you mean by Void ratio? (**SUMMER 2024, 3 Marks; SUMMER 2025, 3 Marks OR**)
- **Q.** What is Degree of Saturation? / What do you mean by Degree of saturation? (**SUMMER 2024, 3 Marks OR; SUMMER 2025, 3 Marks; WINTER 2025, 3 Marks**)

Other Important Questions:**1. Groundwater, Hydrologic Cycle and Basic Terms:**

- **Q. Define Ground water. (WINTER 2022, 3 Marks)**
- **Q. What is ground water? Discuss formation of ground water with neat sketch. [Diagram required – refer to the original question paper] (SUMMER 2022, 7 Marks OR)**
- **Q. What do you mean by Groundwater Hydrology? (SUMMER 2024, 3 Marks OR)**
- **Q. What do you mean by Percolation? (SUMMER 2025, 3 Marks)**
- **Q. What do you mean by Runoff? (SUMMER 2025, 3 Marks)**
- **Q. What do you mean by Water Cycle? (SUMMER 2025, 3 Marks)**
- **Q. Define Evapotranspiration. (SUMMER 2025, 3 Marks OR)**

2. Aquifers and Aquifer Types:

- **Q. Explain with sketch the term Percolated Aquifer. [Diagram required – refer to the original question paper] (SUMMER 2025, 7 Marks OR)**
- **Q. Describe the occurrences of ground water in unconfined & confined aquifer with neat sketch. [Diagram required – refer to the original question paper] (WINTER 2024, 7 Marks OR)**

3. Hydrologic Properties of Water-Bearing Strata:

- **Q. Discuss hydrologic properties of water bearing strata. (WINTER 2022, 7 Marks)**
- **Q. What do you mean by Field capacity? (SUMMER 2024, 3 Marks OR)**
- **Q. What is Specific yield? (SUMMER 2025, 3 Marks OR)**

Chapter 2: Groundwater Hydraulics

Repeated Questions:

1. Darcy's Law and Flow Concepts:

- **Q.** Explain Darcy's law. What is its limitation? Discuss its validity. / Describe Darcy's law and its validity. / Explain Darcy's law and its application to simple flow system. What is its limitation? Discuss its validity. (SUMMER 2022, 3 Marks; WINTER 2022, 7 Marks; SUMMER 2023, 4 Marks; WINTER 2023, 3 Marks; SUMMER 2024, 7 Marks; WINTER 2024, 7 Marks OR; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks)

2. Radial Flow Derivations:

- **Q.** Derive the expression for steady radial groundwater flow in Unconfined aquifer. (SUMMER 2022, 7 Marks; WINTER 2022, 7 Marks; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks OR; WINTER 2024, 7 Marks OR)
- **Q.** Derive the expression for steady radial groundwater flow in Confined aquifer. (SUMMER 2022, 7 Marks OR; SUMMER 2023, 7 Marks OR; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks OR; WINTER 2024, 7 Marks; WINTER 2025, 7 Marks OR)

3. Well Hydraulics: Tests, Interference and Well Types:

- **Q.** What is Cone of depression? Explain with Diagram. / Describe cone of depression. / Explain cone of depression. [Diagram required – refer to the original question paper] (WINTER 2022, 4 Marks; SUMMER 2023, 3 Marks; WINTER 2023, 3 Marks OR; WINTER 2024, 4 Marks OR; WINTER 2025, 3 Marks)
- **Q.** Explain the pumping test to estimate the safe yield from an open well. (SUMMER 2022, 4 Marks; SUMMER 2023, 4 Marks OR; WINTER 2023, 4 Marks; WINTER 2024, 4 Marks)
- **Q.** Explain the recuperation test to estimate the safe yield of an open well. (SUMMER 2023, 4 Marks; WINTER 2023, 4 Marks OR; WINTER 2024, 4 Marks OR)
- **Q.** Explain interference among wells. (WINTER 2022, 4 Marks; SUMMER 2024, 4 Marks OR)
- **Q.** What do you mean by Artesian well? (SUMMER 2022, 3 Marks; SUMMER 2023, 3 Marks OR; WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks; WINTER 2025, 3 Marks)
- **Q.** Give the difference between fully and partial penetrating wells. / Difference between fully and partial penetrating wells. (SUMMER 2022, 4 Marks; SUMMER 2023, 3 Marks; WINTER 2023, 3 Marks)

4. Numerical Problems on Wells:

- **Q.** An artesian tube well has a diameter of 20 cm; thickness of aquifer 30 m; permeability 40 m/day; find yield under drawdown 5 m at well face; use radius of influence as recommended by Schardt. (SUMMER 2022, 7 Marks; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks; WINTER 2024, 7 Marks)
- **Q.** Water is pumped out at the rate of 2500 lit/min from a well of 0.3 m diameter, penetrating fully in an aquifer of 30 m thickness. Drawdowns observed in two adjoining wells at 20 m and 120 m are 8 m and 0.6 m respectively. Determine average hydraulic conductivity. (SUMMER 2023, 7 Marks; WINTER 2024, 7 Marks)
- **Q.** A well penetrates fully a 10 m thick water bearing stratum of medium sand having coefficient of permeability 0.05 m/sec. Well radius 10 cm; drawdown 5 m at well face. Calculate discharge. What will be percentage increase in discharge if radius of well is doubled? Take $R = 300$ m in each case. (SUMMER 2022, 7 Marks OR; SUMMER 2023, 7 Marks OR; WINTER 2023, 7 Marks OR; WINTER 2024, 7 Marks OR)
- **Q.** A pumping test was conducted for an open well of diameter 3.6 m. Water was pumped out at constant rate of 300 lit/min. Find specific yield. Take $h = 3.5$ m. (SUMMER 2023, 3 Marks; WINTER 2023, 3 Marks OR; WINTER 2024, 3 Marks)

- **Q.** Design a tube well for the following data: yield required = 0.081 cumec; thickness of confined aquifer = 30 m; radius of circle influenced = 300 m; permeability coefficient = 60 m/day; drawdown = 5.1 m. **(SUMMER 2023, 7 Marks OR; WINTER 2023, 7 Marks; WINTER 2024, 7 Marks OR)**

Other Important Questions:**1. Darcy's Law and Flow Concepts:**

- **Q.** What do you mean by Laminar flow? **(WINTER 2025, 3 Marks OR)**
- **Q.** What do you mean by Hydraulic gradient? **(WINTER 2025, 3 Marks)**

2. Well Hydraulics: Tests, Interference and Well Types:

- **Q.** What do you mean by Yield of well? **(WINTER 2022, 3 Marks OR)**
- **Q.** Write a note on Test pumping analysis. **(SUMMER 2024, 7 Marks OR)**

Chapter 3: Groundwater Quality

Repeated Questions:

1. Quality Standards and Assessment:

- **Q.** Write down Indian and International standards for Groundwater quality / Indian standards for Groundwater quality / Ground water quality criteria for drinking water. **(SUMMER 2022, 7 Marks; SUMMER 2022, 3 Marks OR; WINTER 2022, 7 Marks OR; SUMMER 2023, 4 Marks OR; WINTER 2023, 4 Marks OR; WINTER 2024; WINTER 2025, 7 Marks)**

2. Salinity Ingress and Contaminants:

- **Q.** Write a note on salinity ingress and its control. **(SUMMER 2025, 7 Marks; WINTER 2025, 4 Marks OR)**

Other Important Questions:

1. Quality Standards and Assessment:

- **Q.** Write a note on physical and chemical analysis of Ground water to assess its quality. **(SUMMER 2025 OR)**

2. Salinity Ingress and Contaminants:

- **Q.** How presence of Arsenic and Fluoride affects Ground water quality? **(SUMMER 2025, 4 Marks)**

Chapter 4: Groundwater Pollution

Repeated Questions:

1. Groundwater Pollution: Meaning and Sources:

- **Q.** What is Groundwater Pollution? / What is Groundwater Contamination? / What do you mean by Groundwater contamination? (**WINTER 2022, 3 Marks; WINTER 2023, 4 Marks; SUMMER 2024, 3 Marks; WINTER 2025, 3 Marks**)
- **Q.** Describe various sources responsible for Groundwater pollution. / Explain in detail different sources responsible for ground water pollution with causes. (**WINTER 2022, 7 Marks; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks; WINTER 2024, 4 Marks OR; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks**)

2. Prevention and Remediation:

- **Q.** Enlist and explain preventive measures for Groundwater pollution. (**WINTER 2022, 7 Marks OR; SUMMER 2024, 7 Marks; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks OR**)
- **Q.** Enlist Groundwater pollution remediation methods and explain any one in detail. / Enlist and explain ground water remediation methods. / Enlist & explain ground water remediation methods. / Enlist and explain ground water pollution remedial and preventive measures. (**SUMMER 2022, 4 Marks OR; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks; WINTER 2024 OR; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks OR**)

Other Important Questions:

None identified.

Chapter 5: Groundwater Conservation

Repeated Questions:

1. Artificial Recharge:

- **Q.** Explain different artificial recharge methods of Groundwater. / Explain various artificial recharge methods for Groundwater. / What is artificial recharge? Explain different artificial recharge methods of ground water. (**SUMMER 2022, 7 Marks; WINTER 2022, 7 Marks; WINTER 2022, 3 Marks OR; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks; WINTER 2024; SUMMER 2025, 7 Marks; WINTER 2025, 7 Marks OR**)
- **Q.** Enlist the site selection criteria for artificial recharge. / Explain site selection criteria for artificial recharge. / Enlist and explain site selection criteria for artificial recharge. (**SUMMER 2022, 3 Marks; WINTER 2022, 7 Marks OR; SUMMER 2023, 4 Marks; WINTER 2023, 4 Marks OR; SUMMER 2024, 7 Marks OR; WINTER 2024; WINTER 2025, 7 Marks**)
- **Q.** Explain artificial recharge for “energy purpose”. (**SUMMER 2022, 4 Marks; SUMMER 2023, 4 Marks OR; WINTER 2023, 4 Marks; WINTER 2024, 4 Marks**)
- **Q.** Explain induced recharge method with their flow pattern. (**SUMMER 2022, 3 Marks OR; SUMMER 2023, 4 Marks; WINTER 2023, 4 Marks; WINTER 2024 OR**)
- **Q.** Explain the different methods of waste water recharge for reuse. (**SUMMER 2023, 3 Marks OR; WINTER 2024**)

2. Conservation, Water Budget and Seepage:

- **Q.** Discuss the hydrological water budget with the aid of example. / Discuss in detail Ground water budget. (**SUMMER 2022, 4 Marks; SUMMER 2025, 4 Marks; WINTER 2025, 4 Marks**)
- **Q.** Discuss on seepage from Surface water. / Write a note on seepage from Surface water. (**WINTER 2022, 4 Marks OR; SUMMER 2024, 7 Marks**)

Other Important Questions:

1. Conservation, Water Budget and Seepage:

- **Q.** What is Groundwater Conservation? (**WINTER 2022, 3 Marks OR**)
- **Q.** What do you mean by Seepage? (**WINTER 2022, 3 Marks**)
