GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEMESTER 6 – OLD PAPER – S22 TO S26 – QUESTION BANK

Subject Name & Code: Water Resources Engineering and Hydrology - 3160610

Chapter 1: Hydrological Parameters (Module I)

Repeated Questions:

1. Precipitation & Rain Gauges (Theory):

- **Q.** Describe various forms/types of precipitation. **(WINTER 2023, 4 Marks; SUMMER 2025, 3 Marks; SUMMER 2026, 3 Marks)**

2. Average Rainfall & Rainfall Data (Theory):

- **Q.** Explain the Isohyetal method to determine average depth of precipitation over an area. **(WINTER 2022, 7 Marks; SUMMER 2024, 4 Marks - with Thiessen; SUMMER 2025, 3 Marks OR)**
- **Q.** Write a short note on Thiessen's polygon method of calculating average rainfall over an area. [Diagram required – refer to the original question paper] **(SUMMER 2023, 4 Marks OR; SUMMER 2024, 4 Marks - with Isohyetal; SUMMER 2026, 7 Marks - numerical application)**

3. Rainfall Analysis (Numerical):

- **Q.** Determine the optimum number of rain gauges in a catchment to limit the error in mean rainfall to a given percentage. [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks - 4 stations, 15% error; WINTER 2023, 7 Marks OR - 5 stations, 12% error; WINTER 2025, 7 Marks - 4 stations, 12% error)**

4. Evaporation, Transpiration & Consumptive Use:

- **Q.** State Dalton's law of evaporation. Discuss various factors affecting rate of evaporation / Explain various methods adopted to evaluate rate of evaporation. **(SUMMER 2022, 3 Marks - only methods; WINTER 2022, 4 Marks - factors; SUMMER 2023, 7 Marks; SUMMER 2025, 7 Marks)**

5. Infiltration:

- **Q.** Determine the infiltration indices (Φ-index / W-index) from given storm data. [Diagram required – refer to the original question paper] **(WINTER 2023, 7 Marks; SUMMER 2025, 7 Marks OR; SUMMER 2026, 7 Marks)**

Other Important Questions:

1. Hydrology Basics & Hydrological Cycle (Theory):

- **Q.** What are applications of hydrology? **(SUMMER 2023, 3 Marks)**
- **Q.** Define: Hyetograph, infiltration, Runoff. **(SUMMER 2024, 3 Marks - partly covers Module II terms)**
- **Q.** Explain the hydrological cycle with its applications and also draw a neat sketch. **(WINTER 2023, 7 Marks)**
- **Q.** Define: Hydrology, Precipitation, Flood. **(WINTER 2023, 3 Marks - Flood falls under Module IV)**

2. Precipitation & Rain Gauges (Theory):

- **Q.** Enlist recording and non-recording type of rain gauges. Explain any one non-recording type with a neat sketch. **(SUMMER 2024, 7 Marks)**
- **Q.** Discuss non-automatic type of rain gauge. **(WINTER 2024, 4 Marks)**
- **Q.** List out automatic rain gauges. Explain any one in detail with a neat sketch. **(WINTER 2025, 4 Marks)**
- **Q.** Enlist different types of rain gauges and explain weighing bucket type rain gauge with sketch. **(SUMMER 2026, 4 Marks)**

3. Average Rainfall & Rainfall Data (Theory):

- **Q.** Describe double mass curve technique to check consistency of rain gauge station data. **(SUMMER 2022, 4 Marks)**
- **Q.** Describe various methods to find out missing rainfall data. **(SUMMER 2025, 4 Marks)**

4. Rainfall Analysis (Numerical):

- **Q.** A rain gauge recorded accumulated rainfall during a storm. Draw the mass rainfall curve and the hyetograph. [Diagram required – refer to the original question paper] **(WINTER 2022, 7 Marks)**

5. Evaporation, Transpiration & Consumptive Use:

- **Q.** Discuss various methods of direct measurement of consumptive use of water. **(WINTER 2024, 7 Marks)**
- **Q.** What is transpiration? Discuss factors affecting it and phytometer method to measure rate of transpiration. **(WINTER 2024, 7 Marks)**
- **Q.** Enlist different methods of measurement of evaporation and explain pan evaporation method. **(SUMMER 2026, 4 Marks OR)**

6. Infiltration:

- **Q.** How can infiltration capacity of soil be measured in field? **(SUMMER 2023, 4 Marks)**
- **Q.** Describe double ring infiltrometer to determine rate of infiltration. **(WINTER 2024, 4 Marks)**
- **Q.** Give Horton's equation and explain how various exponents of the equation are found by experiment. **(SUMMER 2026, 3 Marks)**

Chapter 2: Runoff and Hydrographic Analysis (Module II)

Repeated Questions:

1. Runoff & Drainage Basin Characteristics (Theory):

- **Q.** What is runoff? Discuss various factors affecting runoff from a catchment area. **(WINTER 2024, 7 Marks; SUMMER 2025, 7 Marks; SUMMER 2026, 7 Marks OR)**

2. Hydrograph, Unit Hydrograph & Flow Duration (Theory):

- **Q.** Differentiate between hydrograph and hyetograph (with sketch). [Diagram required – refer to the original question paper] **(SUMMER 2022, 3 Marks; SUMMER 2023, 4 Marks - typo hydrograph and hydrograph; WINTER 2023, 3 Marks OR - typo; SUMMER 2025, 3 Marks OR; SUMMER 2026, 3 Marks)**
- **Q.** Explain the procedure of separating base flow in a given hydrograph / Discuss methods adopted to separate base flow. [Diagram required – refer to the original question paper] **(SUMMER 2022, 4 Marks; SUMMER 2023, 4 Marks; WINTER 2024, 4 Marks OR; WINTER 2025, 3 Marks)**
- **Q.** What is a flow duration curve? Mention its uses. **(SUMMER 2022, 7 Marks; SUMMER 2023, 3 Marks OR)**
- **Q.** Define unit hydrograph and write down the assumptions/limitations of unit hydrograph theory. **(SUMMER 2022, 7 Marks OR; WINTER 2023, 3 Marks; SUMMER 2024, 4 Marks; SUMMER 2025, 3 Marks; WINTER 2025, 3 Marks)**
- **Q.** What is S-hydrograph? Give its uses / Explain S-curve and its applications. **(WINTER 2023, 4 Marks OR; WINTER 2024, 3 Marks; SUMMER 2025, 4 Marks OR; SUMMER 2026, 4 Marks)**

Other Important Questions:

1. Runoff & Drainage Basin Characteristics (Theory):

- **Q.** Define: Drainage basin, Drainage density, Stream density. **(SUMMER 2024, 3 Marks)**
- **Q.** Discuss various methods to determine rate of runoff. **(SUMMER 2023, 7 Marks)**
- **Q.** Discuss any four drainage basin characteristics. **(SUMMER 2025, 4 Marks OR)**
- **Q.** Discuss various physiographic factors affecting shape of hydrograph. **(WINTER 2024, 4 Marks OR)**
- **Q.** Explain how characteristics of drainage basin affect runoff. **(WINTER 2025, 4 Marks)**
- **Q.** Explain Form factor and Compactness coefficient. **(SUMMER 2026, 4 Marks)**

2. Hydrograph, Unit Hydrograph & Flow Duration (Theory):

- **Q.** Define: Direct runoff hydrograph, Unit hydrograph, S-hydrograph. **(WINTER 2022, 3 Marks)**
- **Q.** Explain mass curve? Explain how mass curve is prepared? **(WINTER 2022, 4 Marks)**
- **Q.** Explain method of determining direct runoff from a given storm hydrograph. **(SUMMER 2025, 7 Marks)**

3. Unit Hydrograph (Numerical):

- **Q.** Derive the ordinates of a 6-hour unit hydrograph and area of basin from a given storm hydrograph. [Diagram required – refer to the original question paper] **(SUMMER 2023, 7 Marks)**
- **Q.** The direct runoff hydrograph resulting from a 6.0 cm effective rainfall of 6 hr duration is given. Determine catchment area and ordinates of 6 hr unit hydrograph. [Diagram required – refer to the original question paper] **(SUMMER 2024, 7 Marks)**
- **Q.** Find ordinates of a storm hydrograph from a 3-hour storm with given rainfalls and unit hydrograph ordinates. [Diagram required – refer to the original question paper] **(SUMMER 2024, 7 Marks OR)**

- **Q.** A peak of flood hydrograph due to 6 hr storm is 470 m^3/s … Estimate the peak discharge of 6-hour unit hydrograph. [Data truncated in source – refer to the original question paper] **(WINTER 2022, 7 Marks OR)**
- **Q.** Ordinates of a 3-hr unit hydrograph are given. Compute ordinates of 6-hr unit hydrograph. [Diagram required – refer to the original question paper] **(WINTER 2023, 7 Marks)**
- **Q.** The direct runoff hydrograph resulting from 5.0 cm effective rainfall of 6-hr duration is given. Determine catchment area and ordinates of 6-hr unit hydrograph. [Diagram required – refer to the original question paper] **(WINTER 2024, 7 Marks)**
- **Q.** A 6 hr unit hydrograph for a basin has given ordinates. Determine ordinates of 12 hr unit hydrograph using S-curve method. [Diagram required – refer to the original question paper] **(WINTER 2025, 7 Marks)**
- **Q.** The ordinates of a 3 hr unit hydrograph are given. Find ordinates of a 6 hr UH analytically and sketch it. [Diagram required – refer to the original question paper] **(WINTER 2025, 7 Marks)**
- **Q.** The ordinates of flood hydrograph from a 4 hour rainfall are given. Derive ordinates of 4 hour unit hydrograph for a catchment area of 450 km^2. [Diagram required – refer to the original question paper] **(SUMMER 2026, 7 Marks OR)**

Chapter 3: Groundwater Hydrology and Dams & Reservoirs (Module III)

Repeated Questions:

1. Groundwater – Occurrence, Aquifers & Parameters (Theory):

- **Q.** Explain Darcy's law with its assumptions / limitations / validity. **(WINTER 2022, 4 Marks - limitations; SUMMER 2023, 3 Marks - assumptions; WINTER 2023, 7 Marks - limitations and validity; SUMMER 2024, 4 Marks - limitation; WINTER 2024, 3 Marks OR - limitations; SUMMER 2026, 4 Marks - assumptions)**
- **Q.** Differentiate between confined and unconfined aquifer (with neat sketches). **(WINTER 2023, 4 Marks; SUMMER 2024, 4 Marks; WINTER 2024, 4 Marks; SUMMER 2026, 4 Marks OR)**
- **Q.** Define groundwater parameters: specific yield, specific retention, coefficient of transmissibility, storage coefficient, aquifer, aquiclude, aquifuge, aquitard, well losses, specific capacity, porosity. / Define specific capacity of well, specific retention, coefficient of transmissibility, well losses. **(SUMMER 2022, 3 Marks - confined aquifer, specific yield, coefficient of transmissibility; WINTER 2022, 3 Marks OR - porosity, specific retention, specific yield; SUMMER 2023, 4 Marks OR - specific capacity, specific retention, coefficient of transmissibility, well losses; WINTER 2024, 3 Marks - storage coefficient, aquifuge, specific retention; SUMMER 2025, 4 Marks - aquifer, aquiclude, aquifuge, aquitard; WINTER 2025, 3 Marks - aquiclude, aquifuge, aquitard; WINTER 2025, 3 Marks OR - specific yield, specific retention, transmissibility; SUMMER 2026, 3 Marks OR - aquifer, aquiclude, storage coefficient)**
- **Q.** Explain the recuperation test to estimate the safe yield of an open well. **(WINTER 2022, 7 Marks - numerical; SUMMER 2025, 7 Marks; WINTER 2025, 7 Marks OR)**
- **Q.** Explain with neat sketch the occurrence of groundwater at various locations below the earth surface. **(SUMMER 2022, 7 Marks; WINTER 2022, 3 Marks)**

2. Dams & Spillways:

- **Q.** Write a brief note on gravity dam with its salient features. **(SUMMER 2023, 3 Marks; WINTER 2024, 3 Marks; SUMMER 2025, 3 Marks)**
- **Q.** Distinguish between gravity dam and earth dam / earthen dam. **(WINTER 2023, 4 Marks; SUMMER 2024, 3 Marks)**
- **Q.** Explain various types of energy dissipation devices used below spillway / bucket-type energy dissipaters. **(WINTER 2024, 7 Marks OR; SUMMER 2025, 7 Marks OR)**

3. Reservoirs:

- **Q.** Explain with neat sketch the storage zones of a reservoir. **(WINTER 2022, 7 Marks; WINTER 2023, 7 Marks; WINTER 2025, 4 Marks; SUMMER 2026, 4 Marks)**
- **Q.** Explain reservoir sedimentation – causes, types of sediment load, and control measures. **(WINTER 2022, 7 Marks - causes and reduction; WINTER 2023, 3 Marks - short note; SUMMER 2024, 3 Marks - types of sediment load; SUMMER 2024, 3 Marks - causes; SUMMER 2026, 7 Marks)**
- **Q.** Explain trap efficiency. **(SUMMER 2022, 4 Marks OR - with control methods; WINTER 2022, 3 Marks - definition)**
- **Q.** Explain measures to reduce evaporation losses from reservoir / Describe reservoir losses. **(WINTER 2022, 4 Marks - evaporation measures; SUMMER 2023, 7 Marks OR - reservoir losses and evaporation measures; WINTER 2024, 3 Marks - reservoir losses; WINTER 2025, 4 Marks OR - evaporation measures)**
- **Q.** Explain the mass curve method to determine reservoir capacity / Determine capacity using mass inflow curve. **(SUMMER 2024, 7 Marks OR; SUMMER 2025, 7 Marks OR; SUMMER 2026, 7 Marks OR)**

Other Important Questions:

1. Groundwater – Occurrence, Aquifers & Parameters (Theory):

- **Q.** Define safe yield, secondary yield, design yield. **(WINTER 2022, 3 Marks)**
- **Q.** Distinguish between permeability and transmissibility of soil. **(WINTER 2022, 4 Marks OR)**

2. Wells & Pumping Tests (Theory):

- **Q.** Describe constant level pumping test to find yield of an open well. **(SUMMER 2022, 4 Marks)**

3. Wells – Numerical & Derivation:

- **Q.** An artesian tube well numerical – find yield under given drawdown (Sichardt radius). [Data truncated in source – refer to the original question paper] **(SUMMER 2023, 7 Marks OR)**
- **Q.** A well 0.7 m diameter penetrates fully a confined aquifer … find maximum discharge. [Data truncated in source – refer to the original question paper] **(SUMMER 2024, 7 Marks)**
- **Q.** Design an open well in fine sand to give a discharge of 0.03 cumec under a depression head of 2.5 m. **(WINTER 2022, 7 Marks OR)**
- **Q.** Water was pumped out from a well in a confined aquifer … find the constant rate of pumping. [Data truncated in source – refer to the original question paper] **(WINTER 2023, 7 Marks OR)**
- **Q.** Derive an expression for discharge from a well fully penetrating a confined aquifer. **(WINTER 2025, 7 Marks)**

4. Dams & Spillways:

- **Q.** Give essential requirements of spillway. **(SUMMER 2023, 3 Marks)**
- **Q.** What are various factors that affect the site selection of dam? **(SUMMER 2022, 7 Marks OR)**
- **Q.** Explain dams based upon their function. **(SUMMER 2024, 3 Marks OR)**
- **Q.** Discuss factors affecting selection of dam type. **(WINTER 2022, 4 Marks)**
- **Q.** Write a brief note on any one dam located in Gujarat state. **(SUMMER 2025, 3 Marks)**
- **Q.** Write down classification of dams. **(WINTER 2025, 3 Marks)**

5. Reservoirs:

- **Q.** How will you carry out hydrological investigation for planning of reservoir? **(SUMMER 2022, 3 Marks OR)**
- **Q.** Enlist different types of reservoirs and explain each in brief. **(SUMMER 2024, 7 Marks)**

Chapter 4: Floods and Hydel Power (Module IV)

Repeated Questions:

1. Floods – Causes, Effects & Mitigation:

- **Q.** Discuss various causes of flood. **(WINTER 2022, 7 Marks; SUMMER 2025, 4 Marks; WINTER 2025, 3 Marks OR)**
- **Q.** Write a note on levees / flood walls / flood proofing and flood forecasting. / Write short note on Flood proofing and Flood forecasting. **(SUMMER 2022, 3 Marks - levees; WINTER 2023, 3 Marks - flood proofing and forecasting; WINTER 2024, 3 Marks OR - levees; WINTER 2025, 3 Marks - flood walls; WINTER 2025, 3 Marks OR - levees; SUMMER 2026, 3 Marks OR - levees and flood walls)**

2. Flood Routing, Frequency & Estimation:

- **Q.** Explain flood routing (through reservoirs and open channels), including Muskingum method, Modified Pul's method, and uses. / Explain Muskingum routing method. **(WINTER 2022, 3 Marks - define and uses; SUMMER 2023, 7 Marks - reservoir routing, Modified Pul's & Goodrich; WINTER 2023, 3 Marks OR - through reservoir; SUMMER 2024, 4 Marks - note on flood routing; WINTER 2024, 7 Marks OR - Muskingum channel routing; SUMMER 2026, 7 Marks OR - Muskingum method)**
- **Q.** Explain flood frequency analysis (including Gumbel's method and return period numerical). / Explain theoretical probability distribution Gumbel's method. **(SUMMER 2022, 7 Marks - return period numerical; WINTER 2023, 4 Marks; WINTER 2023, 7 Marks OR - Gumbel's method; SUMMER 2024, 4 Marks OR)**
- **Q.** Explain flood estimation methods (rational method / empirical method). **(SUMMER 2022, 4 Marks - rational; SUMMER 2026, 4 Marks OR - empirical and rational)**

3. Hydropower Plants:

- **Q.** Classify hydropower plants based on head / storage characteristics / plant capacity. **(SUMMER 2022, 7 Marks - storage and head; SUMMER 2023, 4 Marks - storage; WINTER 2023, 4 Marks - classify and explain one; SUMMER 2024, 3 Marks - head; WINTER 2024, 4 Marks - storage; SUMMER 2025, 4 Marks - head and capacity; WINTER 2025, 7 Marks - storage and head; SUMMER 2026, 3 Marks - general classification)**
- **Q.** Explain the components of a hydropower plant (Penstocks, Surge tank, Turbines, Draft tube, general layout). **(SUMMER 2022, 3 Marks - list components and layout; SUMMER 2022, 4 Marks - surge tank; SUMMER 2024, 3 Marks OR - penstocks, surge tank, turbines; WINTER 2024, 3 Marks - penstocks, surge tank, draft tube; WINTER 2025, 7 Marks OR - sketch and explain components; SUMMER 2026, 3 Marks OR - principal components)**

Other Important Questions:

1. Floods – Causes, Effects & Mitigation:

- **Q.** What are adverse effects of flood? **(SUMMER 2023, 3 Marks OR)**
- **Q.** Discuss various structural measures to mitigate flood disaster. **(SUMMER 2023, 7 Marks OR)**
- **Q.** Explain various non-structural mitigation measures adopted to control flood. **(SUMMER 2025, 7 Marks)**
- **Q.** Discuss channel improvement works as flood control measure. **(SUMMER 2025, 4 Marks OR)**

Chapter 5: Drought Management, Water Harvesting and Water Resources Planning (Module V)

Repeated Questions:

1. Drought & Water Conservation:

- **Q.** Explain drought – definition, causes, types, effects, classification, contingency planning. **(WINTER 2022, 7 Marks OR - drought and causes; SUMMER 2023, 4 Marks OR - effects; WINTER 2023, 4 Marks - define and two types; SUMMER 2024, 4 Marks OR - types; WINTER 2024, 4 Marks - effects; SUMMER 2025, 3 Marks OR - define and classify; WINTER 2025, 4 Marks - drought contingency planning; WINTER 2025, 4 Marks OR - drought and causes; SUMMER 2026, 3 Marks - cause and types)**
- **Q.** Discuss various water conservation measures / Need for conservation of water. **(SUMMER 2023, 3 Marks - need; SUMMER 2023, 7 Marks - measures; WINTER 2024, 7 Marks - measures; WINTER 2025, 4 Marks OR - measures)**

2. Water Resources Planning & Project Impacts:

- **Q.** Explain water resources planning – objectives, principles, functional requirements, steps, purposes. **(SUMMER 2022, 3 Marks OR - objectives; SUMMER 2022, 4 Marks OR - functional requirements; WINTER 2022, 4 Marks OR - functional requirements of multi-purpose projects; SUMMER 2023, 3 Marks OR - requirements; SUMMER 2023, 4 Marks - purposes; SUMMER 2023, 7 Marks OR - steps; SUMMER 2024, 7 Marks - need and steps; WINTER 2024, 7 Marks OR - functional requirements; SUMMER 2025, 4 Marks - principles and objectives; SUMMER 2026, 7 Marks - principles and objectives)**
- **Q.** Describe environmental consequences / impacts of water resources projects. **(SUMMER 2022, 7 Marks OR; WINTER 2023, 7 Marks OR; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks OR)**

3. Water Harvesting, Recharge & Check Dams:

- **Q.** Explain roof top rain water harvesting method with a neat sketch. **(WINTER 2022, 4 Marks; SUMMER 2024, 7 Marks OR; WINTER 2025, 4 Marks)**

Other Important Questions:

1. Water Harvesting, Recharge & Check Dams:

- **Q.** Write a note on check dam. **(SUMMER 2024, 4 Marks)**
- **Q.** What is artificial ground water recharge? Explain any two methods. **(WINTER 2022, 3 Marks OR)**
- **Q.** Write short note on “Water harvesting system”. **(WINTER 2023, 4 Marks OR)**
- **Q.** Write short note on runoff enhancement. **(SUMMER 2025, 3 Marks)**
- **Q.** Explain different methods of rain water harvesting. **(SUMMER 2026, 7 Marks)**
- **Q.** Discuss the recharge to ground water method of rain water harvesting. **(WINTER 2025, 7 Marks)**

Uncategorised Questions

Repeated Questions:

None identified.

Other Important Questions:

1. Questions with Missing Text:

- **Q.** Define the following terms. [Data truncated in source – refer to the original question paper] **(WINTER 2023, 3 Marks)**

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