GUJARAT TECHNOLOGICAL UNIVERSITY

BE 7 SEMESTER – OLD PAPER – SUMMER 2022 TO SUMMER 2026 – QUESTION BANK

Subject Name & Code: Design of Hydraulic Structures - 3170621

Module 1 – Types of Dams and Foundation Treatment

Repeated Questions:

1. Selection of Dam Type and Dam Site:

- **Q.** Discuss various factors which govern the selection of type of dam / Enlist the factors which are considered in the selection of the site of proposed dam / What are the factors affecting the selection of site for a dam? **(SUMMER 2022, 3 Marks; SUMMER 2023, 4 Marks; WINTER 2023, 7 Marks; WINTER 2024, 7 Marks; SUMMER 2025, 4 Marks; SUMMER 2025, 7 Marks; WINTER 2025, 4 Marks)**

2. Subsurface Exploration:

- **Q.** Explain the importance of subsurface exploration / Why is it important to carry out Subsurface Exploration before the construction of dam? **(SUMMER 2022, 4 Marks; SUMMER 2022, 4 Marks; WINTER 2022, 4 Marks; SUMMER 2024, 7 Marks; WINTER 2025, 3 Marks)**

3. Foundation Treatment:

- **Q.** Enlist and explain Foundation Treatment Methods. / Discuss various foundation treatment methods used in dam. / Write a brief note on the necessity and methods of foundation treatments of gravity dam. **(SUMMER 2022, 7 Marks; WINTER 2022, 7 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks OR; WINTER 2024, 7 Marks OR; WINTER 2025, 4 Marks)**

4. Classification of Dams:

- **Q.** Classify different types of Dams. / How do you classify dam according to their use? **(SUMMER 2022, 3 Marks; SUMMER 2023, 3 Marks; WINTER 2023, 3 Marks)**

Other Important Questions:

1. Dam Site Investigations and Sub-surface Explorations:

- **Q.** Write a short note on Dam Sites Investigations. **(SUMMER 2022, 4 Marks)**
- **Q.** How the investigations for a dam site are done? **(SUMMER 2024, 4 Marks)**
- **Q.** What are the main types of sub-surface explorations? Explain what is their importance in a project of a dam? **(SUMMER 2024, 7 Marks)**

2. Dam Materials and Basic Terms:

- **Q.** What are the different materials that are commonly used for dam construction and what are their comparative advantages and disadvantages? **(SUMMER 2023, 7 Marks)**
- **Q.** What is meant by a "dam and a reservoir". **(SUMMER 2024, 3 Marks)**

3. Arch Dams:

- **Q.** Briefly explain Arch dam with figure. [Diagram required – refer to the original question paper] **(WINTER 2023, 4 Marks)**
- **Q.** What is arch dam and when it is selected? **(SUMMER 2024, 4 Marks OR)**

Module 2 – Gravity Dams

Repeated Questions:

1. Forces on Gravity Dam:

- **Q.** Enumerate various forces acting on gravity dam. / Discuss various external forces acting on gravity dam. / What is gravity dam? Enumerate the various forces acting on a gravity dam. **(SUMMER 2022, 3 Marks; WINTER 2022, 3 Marks; SUMMER 2025, 4 Marks)**

2. Advantages and Disadvantages of Gravity Dam:

- **Q.** Enlist the advantages and disadvantages of gravity dam over other dams? / What are the advantages and disadvantages of gravity dam over the other type? **(SUMMER 2022, 4 Marks; SUMMER 2023, 4 Marks)**

3. Practical Profile of Gravity Dam:

- **Q.** Explain with neat sketch the practical profile of a Gravity Dam / Explain the Practical profile of a gravity dam. / Discuss the practical profile of gravity dam. [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks; WINTER 2023, 3 Marks; WINTER 2025, 7 Marks)**

4. Failure of Gravity Dams:

- **Q.** What are the different causes of failure of gravity dams? / What are the causes of failure of a gravity dam? / What are the various modes of failure of gravity dam? Discuss each of these briefly. **(SUMMER 2022, 3 Marks OR; SUMMER 2024, 4 Marks OR; SUMMER 2025, 3 Marks)**

5. High Gravity Dam vs Low Gravity Dam:

- **Q.** Differentiate between high dam and low dam. / Distinguish clearly between a low gravity dam and high gravity dam. / Differentiate between a low gravity dam and a high gravity dam. / Differentiate between high gravity dam and low gravity dam. **(SUMMER 2022, 4 Marks OR; WINTER 2022, 4 Marks; SUMMER 2023, 3 Marks; WINTER 2023, 4 Marks OR)**

6. Galleries in Gravity Dam:

- **Q.** Enlist and explain types of galleries with their importance with function. / Briefly explain the function of drainage gallery in gravity dam? / Write a short note on galleries in dam. / Discuss various purposes for which galleries are provided in dams. / What are the functions of gallery in a gravity dam? **(SUMMER 2022, 7 Marks OR; SUMMER 2023, 4 Marks OR; SUMMER 2024, 7 Marks; SUMMER 2025, 4 Marks; WINTER 2025, 3 Marks)**

7. Joints in Gravity Dam:

- **Q.** Explain Construction and Contraction joints in gravity dam. / What are construction and contraction joints in dams? / Discuss various Contraction joints and horizontal joints to be provided in a dam. / Write a brief note on joints in gravity dam. **(WINTER 2022, 7 Marks; SUMMER 2024, 3 Marks OR; SUMMER 2025, 7 Marks OR; WINTER 2025, 4 Marks)**

8. Earthquake Effects on Gravity Dam:

- **Q.** Explain how you would account for earthquake effects in design of a gravity dam. / Explain the effect of earthquake force in the design of gravity dam. **(WINTER 2022, 7 Marks OR; WINTER 2025, 7 Marks)**

9. Earthquake Forces on Gravity Dam (Numerical):

- **Q.** For a preliminary design of a concrete gravity dam below data is given: [Data truncated in source – refer to the original question paper] Calculate 1) Horizontal earthquake force due to inertia of dam material 2) Horizontal earthquake force due to inertia of the reservoir water. **(SUMMER 2023, 7 Marks OR; SUMMER 2024, 7 Marks OR)**

10. Slope Stability of Earth Dams (Swedish Slip Circle Method):

- **Q.** Explain the Swedish slip circle method of analyzing the stability of an earth dam slopes. **(WINTER 2023, 7 Marks OR; WINTER 2024, 7 Marks OR - mapped to Earth Dams as well, but appears repeatedly in the Gravity Dam OR sections)**

Other Important Questions:

1. Elementary Profile, Practical Profile and Design Principles:

- **Q.** What do you mean by elementary profile of a gravity dam? **(SUMMER 2023, 3 Marks OR)**
- **Q.** Explain the principles on which design of a gravity dam is based. **(SUMMER 2024, 3 Marks)**
- **Q.** Differentiate between elementary and practical profile of a gravity dam. **(SUMMER 2024, 4 Marks)**
- **Q.** Draw the typical layout of a gravity dam showing its components. [Diagram required – refer to the original question paper] **(SUMMER 2025, 3 Marks)**
- **Q.** Prove that the base width b for an elementary profile of a low gravity dam is given by $b = h / \sqrt{(s - 1)}$ **(SUMMER 2025, 7 Marks)**

2. Uplift Pressure:

- **Q.** Explain methods of reduction of uplift pressure with neat sketch. [Diagram required – refer to the original question paper] **(WINTER 2022, 4 Marks)**
- **Q.** Draw the uplift pressure diagram without drains and with drains for a gravity dam. [Diagram required – refer to the original question paper] **(SUMMER 2025, 3 Marks)**

3. Stability Analysis and Stresses in Gravity Dam:

- **Q.** Explain analytical method for stability analysis of a gravity dam. **(WINTER 2022, 7 Marks OR)**
- **Q.** How would you compute seepage force in the design of a gravity dam under various scenarios? Explain it. **(WINTER 2024, 7 Marks OR)**
- **Q.** What is principal stress in a gravity dam? Derive expression of normal and shear stress in a gravity dam. **(WINTER 2024, 7 Marks OR)**
- **Q.** Obtain the condition for no-tension criteria in a gravity dam. **(WINTER 2025, 3 Marks OR)**

4. Roller Compacted Concrete (RCC) Dams:

- **Q.** Briefly explain "Roller compacted concrete gravity dam". **(WINTER 2023, 4 Marks)**
- **Q.** Describe the construction techniques of roller compacted concrete dams. **(WINTER 2025, 7 Marks OR)**

5. Water Stops:

- **Q.** What are the functions of Water stops in gravity dam? **(WINTER 2025, 3 Marks)**

6. Design and Stability of Gravity Dam (Numerical):

- **Q.** Give answers to the following questions by considering that the safe limit of stress on the masonry should not exceed 350 tonnes/m² [Data truncated in source – refer to the original question paper] (a) What should be the maximum height of elementary profile of a dam? (b) Determine base width. (c) Find the value of H and B, if uplift intensity factor is 0.67 and factor of safety is 2. **(SUMMER 2022, 7 Marks OR)**
- **Q.** Design the practical profile of a concrete gravity dam for the given data. RL of base of dam = 65 m, RL of HFL = 130 m, Safe compressive stress in concrete = 3000 kN/m², Specific gravity of concrete = 2.4, Height of waves = 1.0 m. **(WINTER 2023, 7 Marks)**
- **Q.** A trapezoidal gravity dam is 10 meter high. It has a top width of 1 meter and base width of 9 meter [Data truncated in source – refer to the original question paper] 1) Calculate compressive stresses at toe and heel for the dam 2) Calculate factor safety against overturning in dam. **(SUMMER 2023, 7 Marks)**

- **Q.** A section of gravity dam having 5.0m top width and base width of 35m. The height of dam is 33m [Data truncated in source – refer to the original question paper] Check the stability of dam against overturning and sliding with no drain available and no tension crack. Take friction factor = 0.7. Consider water pressure and uplift pressure only. **(WINTER 2024, 14 Marks)**

Module 3 – Earth and Rock-fill Dams

Repeated Questions:

1. Phreatic Line:

- **Q.** Define and explain the term "phreatic line" in earthen dam with sketch. / Explain significance of phreatic line in an earthen dam. / What is phreatic line? Explain its importance in an embankment dam. Explain graphical method of obtaining the phreatic line in an earthen dam. [Diagram required – refer to the original question paper] **(SUMMER 2023, 4 Marks; SUMMER 2024, 4 Marks; WINTER 2024, 7 Marks)**

2. Seepage Control Measures:

- **Q.** What precautions and remedial measures would you undertake to control the "seepage" through earthen dam body and through the dam foundation? / Explain briefly various foundation seepage control measures. / Describe with neat sketches various methods adopted for controlling seepage through the body of the dam and through the foundation. / What are the measures taken for the seepage control and cutoff? [Diagram required – refer to the original question paper] **(SUMMER 2022, 4 Marks OR; WINTER 2023, 3 Marks; SUMMER 2024, 7 Marks; SUMMER 2025, 4 Marks OR)**

3. Causes of Failure of Earth Dams:

- **Q.** What are the various causes of failure of earth dam? Draw sketches to illustrate the answers. / Enlist and explain the causes of failure of earth dams. / What are the various causes of failures of earth dam? [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks OR)**

4. Types of Earth Dams:

- **Q.** Enlist and explain the type of earthen dams. / Enlist types of earthen dams with their sketches. / Give a detailed classification of earth dams. [Diagram required – refer to the original question paper] **(SUMMER 2022, 3 Marks; SUMMER 2023, 4 Marks OR; SUMMER 2024, 3 Marks OR)**

5. Slope Protection of Earth Dams:

- **Q.** Explain side slope protection measures of earth dams. / What are the different side slope protection measures are provided in the earth dams? / Explain the slope protection in earth dams. **(SUMMER 2022, 4 Marks; WINTER 2022, 4 Marks; WINTER 2025, 4 Marks)**

6. Stability of Earth Dam Slopes:

- **Q.** Describe the method used for analysing stability of slope of an earthen dam. / Describe the method used for analyzing stability of slope of an earthen dam. / How would you calculate stability of downstream slope of an earthen dam. Explain its procedure. What is the severest condition for a downstream slope? **(WINTER 2022, 7 Marks; WINTER 2024, 7 Marks; WINTER 2025, 7 Marks OR)**

7. Seepage Through Earth Dam (Numerical):

- **Q.** A homogeneous earth dam is 43 meter high. The free-board provided is 3 meter. A 30 meter long horizontal filter is also provided on the downstream end. A flownet was drawn for the dam section. The flownet comprised 5 flow channels and 15 potential drops. If the permeability of the material in the dam 3×10^{-5} meter/second. Calculate the seepage flow per meter length of the earth dam. If the dam is 500 meter long. Calculate the total discharge through the body of the dams. **(SUMMER 2023, 7 Marks; SUMMER 2024, 7 Marks OR)**

Other Important Questions:

1. General Concepts, Design and Construction of Earth Dams:

- **Q.** What are "earthen dams" and under what circumstances are they preferred? **(SUMMER 2023, 3 Marks)**
- **Q.** Clarify the importance of core and casing for the earth dam. **(SUMMER 2022, 3 Marks OR)**

- **Q.** Explain Zoned embankment type dam with neat sketch. [Diagram required – refer to the original question paper] **(WINTER 2023, 3 Marks OR)**
- **Q.** Explain the design principle for earthen dam in shortly. **(SUMMER 2024, 3 Marks)**
- **Q.** Describe the procedure of selection of a suitable section for an earthen dam as per the available material. **(WINTER 2024, 7 Marks)**
- **Q.** Enlist the methods of construction used for constructing earthen dam? **(SUMMER 2023, 3 Marks OR)**
- **Q.** Write the construction procedure of earth and rockfill dams. **(WINTER 2022, 7 Marks OR)**

2. Seepage, Flow Net, Pore Pressure and Seepage Line (Theory):

- **Q.** Explain about Flow Net. Also write its characteristics. **(WINTER 2023, 3 Marks)**
- **Q.** What is meant by pore pressure and what is its significance in design of earthen dams? **(WINTER 2023, 4 Marks)**
- **Q.** Explain the method of developing seepage line for an earth dam without horizontal filter at downstream. **(WINTER 2022, 7 Marks)**
- **Q.** Draw a typical section of earthen dam having a horizontal filter at downstream. [Diagram required – refer to the original question paper] **(WINTER 2022, 3 Marks)**
- **Q.** Describe with neat sketch how top seepage line is drawn in a homogeneous dam without any arrangement for drainage. [Diagram required – refer to the original question paper] **(SUMMER 2025, 7 Marks)**

3. Drainage Systems, Filters and Relief Wells:

- **Q.** Write a short note on drainage system for the earth dam. **(SUMMER 2022, 7 Marks OR)**
- **Q.** Discuss the provision of drainage system in earth dams. **(WINTER 2022, 4 Marks OR)**
- **Q.** Write a note on (i) Chimney drain (ii) Relief wells. **(WINTER 2023, 4 Marks OR)**
- **Q.** Explain the terms (i) turfing, (ii) pitching, (iii) relief wells **(SUMMER 2025, 3 Marks)**
- **Q.** Explain different types of drainage arrangements in the downstream portion of the earth dam. **(SUMMER 2025, 3 Marks OR)**
- **Q.** Write a note on filters in earth dams. **(WINTER 2025, 3 Marks)**

4. Failures and Stability of Earth Dams (Theory):

- **Q.** Describe various seepage failures and structural failures of an earthen dam and their remedies. **(WINTER 2024, 7 Marks)**
- **Q.** Discuss the stability of foundation of an earth dam against horizontal shear stress. **(SUMMER 2025, 7 Marks OR)**
- **Q.** Describe hydraulic and seepage failure of earthen dam. **(WINTER 2025, 7 Marks)**
- **Q.** Explain the method of locating center of critical slip circle in earth dams. **(WINTER 2025, 7 Marks)**

5. Rockfill Dams:

- **Q.** What are "rock fill dams" and what are their advantages over earthen dams? Draw a neat sketch of the cross section of a rock fill dam. [Diagram required – refer to the original question paper] **(WINTER 2023, 7 Marks)**
- **Q.** What are rockfill dam and how it is more advantageous over earthen dam? **(SUMMER 2024, 4 Marks OR)**
- **Q.** What is a rockfill dam? Describe its salient features with a neat sketch. [Diagram required – refer to the original question paper] **(SUMMER 2025, 3 Marks OR)**
- **Q.** Describe with neat sketches the various types of upstream impervious membranes used for Rockfill dams. [Diagram required – refer to the original question paper] **(SUMMER 2025, 7 Marks)**
- **Q.** Explain different types of settlements in rockfill dam. **(WINTER 2022, 3 Marks)**

- **Q.** Write a note on settlement of rockfill dams. **(WINTER 2025, 4 Marks OR)**

6. Seepage and Design of Earth Dams (Numerical):

- **Q.** Determine the seepage through foundation for the given dam section (fig. 1) using Darcy's formula. Assume Coefficient of permeability as 0.2×10^{-6} m/s. [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks)**
- **Q.** An earthen dam has following dimensions: 1) Base width B = 75 meter [Data truncated in source – refer to the original question paper] Compute the length of an impervious upstream blanket required. Neglect seepage through blanket. **(SUMMER 2023, 7 Marks OR)**
- **Q.** A homogeneous earth dam is 30m high and has a crest width of 5m [Data truncated in source – refer to the original question paper] Compute seepage discharge through the dam and also compute ordinates of phreatic line and plot it graphically [Data truncated in source – refer to the original question paper] Take coefficient of permeability = 1×10^{-6} m/s. **(WINTER 2024, 14 Marks OR)**

Module 4 – Spillways, Sluices and Crest Gates

Repeated Questions:

1. Gated and Non-Gated Spillways:

- **Q.** What are the merits and demerits of gated spillway upon non-gated spillway? / What are the advantages of gated spillway over non-gated spillway? / Discuss the merits and demerits of installing spillway gates. **(WINTER 2022, 4 Marks; SUMMER 2023, 4 Marks OR; WINTER 2023, 3 Marks; SUMMER 2024, 4 Marks)**

2. Types of Spillways:

- **Q.** Enlist the various type of spillway with its sketches and explain any one in detail. / Describe briefly the different types of Spillways. [Diagram required – refer to the original question paper] **(SUMMER 2023, 7 Marks OR; SUMMER 2025, 4 Marks)**

3. Chute Spillway:

- **Q.** Describe design features of chute spillway. / Explain the design features of chute spillway. / Describe with a neat sketch a chute spillway. Also discuss various design considerations of a chute spillway. [Diagram required – refer to the original question paper] **(WINTER 2022, 4 Marks OR; WINTER 2024, 7 Marks; SUMMER 2025, 7 Marks OR)**

4. Discharge Over Ogee Weir (Numerical):

- **Q.** Compute the discharge over an ogee shaped weir where co-efficient of discharge is equal to 2.5 at a head of 4 meter. The length of spillway is 40 meter. The weir crest is 6 meter above the bottom of the approach channel which has the same width as that of the spillway. **(SUMMER 2023, 4 Marks; SUMMER 2024, 7 Marks)**

Other Important Questions:

1. Basic Concepts of Spillways:

- **Q.** Specify the components of spillway. **(SUMMER 2022, 3 Marks)**
- **Q.** What is the spillway and why it necessary in dam. **(SUMMER 2023, 3 Marks OR)**
- **Q.** Define spillway and enlist types of spillway **(SUMMER 2024, 3 Marks)**
- **Q.** Define spillway. What is the purpose of its provision? What are the essential requirements? Where is the spillway located? **(WINTER 2023, 7 Marks)**
- **Q.** Explain the difference between controlled and uncontrolled spillways. **(WINTER 2022, 3 Marks)**

2. Ogee Spillway:

- **Q.** Explain design criteria for ogee spillway. Also discuss about ogee profile. **(WINTER 2022, 7 Marks)**
- **Q.** Discuss the various factors on which the value of the coefficient of discharge of an ogee spillway depends. **(SUMMER 2025, 4 Marks OR)**
- **Q.** Explain design criteria of ogee spillway. **(WINTER 2025, 7 Marks)**
- **Q.** Explain ogee fall with sketch. [Diagram required – refer to the original question paper] **(WINTER 2023, 3 Marks OR)**

3. Ogee Spillway vs Chute Spillway:

- **Q.** Differentiate between ogee spillway and chute spillway. **(SUMMER 2022, 7 Marks)**
- **Q.** Give the comparison between ogee spillway and chute spillway. **(WINTER 2025, 3 Marks OR)**

4. Side Channel, Shaft and Siphon Spillways:

- **Q.** Write an explanatory note on shaft spillway. **(WINTER 2022, 3 Marks OR)**
- **Q.** Explain the use of priming devices in syphon spillway. **(WINTER 2022, 3 Marks OR)**
- **Q.** Explain Side channel spillway with neat sketch. [Diagram required – refer to the original question paper] **(WINTER 2023, 4 Marks)**

- **Q.** Discuss the advantages as well as the limitations of a siphon spillway. **(SUMMER 2025, 4 Marks)**
- **Q.** Derive an equation for the water surface profile developed in a side channel spillway. **(SUMMER 2025, 7 Marks)**
- **Q.** Write a note on side channel spillway. **(WINTER 2025, 4 Marks)**

5. Spillway Gates:

- **Q.** Evaluate the advantages and disadvantages of gated spillways compared to ungated spillways. **(SUMMER 2026, 4 Marks)**
- **Q.** Evaluate the effectiveness of different types of spillway gates in flood control operations. **(SUMMER 2026, 4 Marks OR)**

6. Cavitation and Erosion of Spillway Surface:

- **Q.** Write a brief note on cavitations/erosion of spillway surface. **(SUMMER 2022, 4 Marks)**
- **Q.** Explain ogee spillway. What is cavitation in ogee spillway and what are the causes? Its remedial measures suggest. **(WINTER 2024, 7 Marks OR)**
- **Q.** Discuss the cavitation in ogee spillway. **(WINTER 2025, 4 Marks OR)**
- **Q.** Assess the role of aeration galleries in mitigating cavitation damage and improving spillway durability. **(SUMMER 2026, 3 Marks)**

7. Downstream Erosion:

- **Q.** Analyze the impact of spillway discharge on downstream erosion and suggest mitigation methods. **(SUMMER 2026)**

Module 5 – Energy Dissipators

Repeated Questions:

1. Stilling Basin:

- **Q.** What is the stilling basins and where it is used? / What is stilling basin? And when it is used? **(SUMMER 2023, 3 Marks; SUMMER 2024, 4 Marks)**

2. Energy Dissipators – Meaning and Need:

- **Q.** What is meant by an energy dissipator? Why it is important in hydraulic structure? / Define energy dissipators. What are the needs to provide it? / Define energy dissipators. Discuss the needs to provide them. **(SUMMER 2023, 4 Marks; WINTER 2023, 4 Marks; WINTER 2025, 3 Marks)**

3. Energy Dissipation by Hydraulic Jump:

- **Q.** Explain briefly energy dissipation by hydraulic jump in hydraulic structures. / Explain energy dissipation by formation of hydraulic jump. / Explain the energy dissipation by hydraulic jump in hydraulic structures. **(SUMMER 2022, 4 Marks OR; SUMMER 2023, 7 Marks; SUMMER 2026, 7 Marks)**

4. Bucket Type Energy Dissipators:

- **Q.** Explain briefly all bucket type energy dissipators with sketch. / Discuss bucket type energy dissipators with neat sketches. / Describe with neat sketches the various types of bucket type energy dissipators. [Diagram required – refer to the original question paper] **(SUMMER 2023, 7 Marks OR; WINTER 2023, 7 Marks OR; SUMMER 2025, 7 Marks OR)**

5. Stilling Basin – Types and Design Features:

- **Q.** Enlist the design criteria for stilling basin. Also explain IS standardized basins. / Enlist different types of stilling basins and explain USBR basins in detail. **(SUMMER 2022, 7 Marks OR; WINTER 2022, 7 Marks OR)**
- **Q.** Define stilling basin and its function. Describe design features of components of stilling basin. **(WINTER 2024, 7 Marks)**

Other Important Questions:

1. Need and Types of Energy Dissipation Works:

- **Q.** Why is energy dissipation necessary below overflow spillway? **(SUMMER 2022, 3 Marks OR)**
- **Q.** Why it is necessary to protect the stream bed below spillway? **(SUMMER 2024, 3 Marks)**
- **Q.** What is the necessity of energy dissipation work? Explain various types of energy dissipation works with figure. [Diagram required – refer to the original question paper] **(WINTER 2024, 7 Marks)**
- **Q.** Describe various energy dissipation devices used below spillway in relation to the position of jump height curve (JHC) and tail water rating curve (TWRC). **(WINTER 2025, 7 Marks OR)**
- **Q.** Explain how tailwater depth variations influence the efficiency of energy dissipation. **(SUMMER 2026, 3 Marks OR)**

2. Hydraulic Jump:

- **Q.** What is hydraulic jump? **(SUMMER 2024, 3 Marks OR)**
- **Q.** Write a note on a location of hydraulic jump. **(SUMMER 2025, 4 Marks OR)**
- **Q.** Explain various types of hydraulic jumps. **(WINTER 2025, 4 Marks OR)**

3. Stilling Basin Components and IS Basins:

- **Q.** Define: Chute blocks, Dentated sills, Baffle piers. **(WINTER 2022, 3 Marks OR)**
- **Q.** Write a brief note on I.S.I. standardized basins. **(WINTER 2022, 4 Marks OR)**

- **Q.** Write the functions of chute blocks and baffle blocks in stilling basins. **(SUMMER 2025, 3 Marks)**
- **Q.** Briefly explain IS type I stilling basin. **(WINTER 2025, 3 Marks OR)**

4. Bucket Type Dissipators – Notes:

- **Q.** Write a note on Bucket type energy dissipater. **(WINTER 2022, 3 Marks)**
- **Q.** Explain the functional and technical difference between roller bucket and ski jump bucket with sketch. [Diagram required – refer to the original question paper] **(SUMMER 2024, 7 Marks)**
- **Q.** Write a note on Ski-jump bucket. **(SUMMER 2025, 3 Marks OR)**

5. Design of Stilling Basin (Numerical):

- **Q.** Design a stilling basin by assuming suitable data related to flow, velocity and tailwater conditions. **(SUMMER 2026, 7 Marks OR)**

****