GUJARAT TECHNOLOGICAL UNIVERSITY

BE 7 SEMESTER – OLD PAPER – S22 TO S26 – QUESTION BANK

Subject Name & Code: Irrigation Engineering - 3170609

Module 1 – Irrigation (Definition, Necessity, Scope, Benefits, Water Requirement of Crops)

Repeated Questions:

1. Duty, Delta and Soil Moisture Constants:

- **Q.** Define Duty and Delta. Derive the relationship between Duty and Delta for a given base period. **(WINTER 2022, 4 Marks; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks OR; SUMMER 2024, 4 Marks; SUMMER 2025, 7 Marks; SUMMER 2026, 4 Marks)**
- **Q.** Discuss various factors affecting duty of water. **(WINTER 2023, 7 Marks OR; SUMMER 2025, 3 Marks OR)**
- **Q.** Define the following terms: (i) Field capacity (ii) Wilting point / Ultimate wilting point (iii) Hygroscopic water (iv) Saturation capacity (v) Permanent wilting point. **(WINTER 2022, 3 Marks; WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks; WINTER 2024, 3 Marks; WINTER 2025, 3 Marks; SUMMER 2026, 3 Marks)**

2. Scope, Benefits and Assessment of Irrigation:

- **Q.** Discuss the scope of irrigation engineering. **(SUMMER 2022, 7 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 4 Marks; SUMMER 2025, 7 Marks)**
- **Q.** Discuss the benefits and ill-effects of irrigation. **(WINTER 2023, 4 Marks; WINTER 2024, 7 Marks; SUMMER 2025, 4 Marks)**
- **Q.** Discuss various methods of assessment of irrigation water charges. **(SUMMER 2023, 4 Marks; SUMMER 2024, 7 Marks)**

3. Methods of Irrigation and Irrigation Efficiencies:

- **Q.** Enlist/Explain various methods of application of irrigation water and explain Basin and Furrow / Controlled flooding methods. **(WINTER 2023, 4 Marks OR; SUMMER 2024, 7 Marks; WINTER 2025, 7 Marks OR)**
- **Q.** Explain irrigation efficiencies (Water conveyance efficiency, Water application efficiency). **(SUMMER 2023, 3 Marks OR; WINTER 2023, 4 Marks OR; WINTER 2025, 3 Marks OR)**

Other Important Questions:

1. Crop Water Requirement and Crop Terms (Theory):

- **Q.** Explain (i) Capacity factor and (ii) Time factor. **(WINTER 2025, 4 Marks)**
- **Q.** Give list of crops in Rabi and Kharif seasons. **(WINTER 2025, 3 Marks)**
- **Q.** Define Gross command area and Culturable Command Area (Differentiate). **(WINTER 2025, 3 Marks OR)**
- **Q.** How water requirement of crops measured? **(SUMMER 2023, 3 Marks)**
- **Q.** Explain the following terms: a) Cash crops b) Paleo c) Kor watering d) Crop ratio **(SUMMER 2025, 4 Marks OR)**
- **Q.** Explain how will you proceed for determining the field irrigation requirement (FIR) for an important crop like wheat? **(SUMMER 2025, 7 Marks OR)**

2. Irrigation Systems, Drip Irrigation and History (Theory):

- **Q.** Explain Drip irrigation system with neat sketch. [Diagram required – refer to the original question paper] **(SUMMER 2026, 7 Marks)**

- **Q.** Enumerate advantages of drip irrigation system. **(SUMMER 2024, 3 Marks)**
- **Q.** Discuss engineering aspect of scope of irrigation engineering. **(SUMMER 2024, 4 Marks)**
- **Q.** Explain irrigation system based on source from which water is drawn. **(SUMMER 2022, 4 Marks)**
- **Q.** Write a brief note on history of irrigation development in India. **(WINTER 2024, 4 Marks)**

3. Headworks and Dams (Other):

- **Q.** What is the necessity of diversion headwork? State different types of diversion headwork. **(SUMMER 2023, 3 Marks)**
- **Q.** Enumerate important parts of a gravity dam and write brief note on drainage galleries. **(SUMMER 2022, 4 Marks)**

4. Numerical Problems:

- **Q.** Following is data about the crop. Taking a time factor of 0.70 calculate the discharge required at the head of canal. If the canal capacity factor is 0.80 determine the design discharge. [Table required – refer to the original question paper] **(WINTER 2025, 7 Marks)**
- **Q.** After how many days will you supply water to soil in order to ensure efficient irrigation of the given crop, if (1) Field capacity of soil = 25% (2) Permanent wilting point = 15% (3) Density of soil = 1.5 g/cm³ (4) Effective depth of root zone = 70 cm (5) Daily consumptive use of water for the given crop = 11 mm (6) Consider readily available moisture be 80% of the available moisture. **(WINTER 2022, 7 Marks)**
- **Q.** A crop requires 900 mm of water for a base period of 120 days. Find the duty of water. **(WINTER 2024, 4 Marks)**

Module 2 – Diversion Works & Storage Works

Repeated Questions:

1. Diversion Headwork and Weirs:

- **Q.** Sketch the layout of a typical diversion headwork and describe briefly the functions of the various components of diversion headwork. [Diagram required – refer to the original question paper] **(SUMMER 2022, 3 Marks; WINTER 2024, 7 Marks OR; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks; SUMMER 2026, 7 Marks OR)**
- **Q.** Distinguish between a weir and a barrage. **(SUMMER 2022, 3 Marks; WINTER 2024, 7 Marks; SUMMER 2025, 4 Marks OR)**
- **Q.** Explain vertical drop weir with a neat sketch. [Diagram required – refer to the original question paper] **(WINTER 2022, 4 Marks; SUMMER 2026, 4 Marks)**

2. Design of Weirs on Pervious Foundation:

- **Q.** Describe various causes of failures of a weir on pervious foundation and their control measures. **(SUMMER 2022, 7 Marks; WINTER 2022, 4 Marks OR; SUMMER 2026, 7 Marks)**
- **Q.** Explain Bligh's creep theory for the design of weir over pervious foundation. **(WINTER 2023, 7 Marks; WINTER 2024, 7 Marks; WINTER 2025, 4 Marks OR)**
- **Q.** Explain Khosla's theory / method of independent variables on the design of weirs on permeable foundation. **(SUMMER 2022, 7 Marks; WINTER 2022, 7 Marks; SUMMER 2023, 3 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks OR; SUMMER 2025, 7 Marks)**
- **Q.** Explain exit gradient. **(SUMMER 2024, 7 Marks OR; SUMMER 2025, 3 Marks OR; WINTER 2025, 3 Marks)**
- **Q.** Differentiate between Khosla's theory and Bligh's theory for the design of weir on a permeable foundation. **(WINTER 2022, 7 Marks OR; SUMMER 2023, 3 Marks; SUMMER 2025, 4 Marks)**

3. Dams – Classification and Site Selection:

- **Q.** Give classification of dams with brief description and sketch / Enlist factors to be considered while selecting site for a dam. [Diagram required – refer to the original question paper] **(WINTER 2022, 3 Marks; SUMMER 2024, 7 Marks; WINTER 2024, 3 Marks; WINTER 2025, 7 Marks OR; SUMMER 2026, 3 Marks)**

4. Earthen Dams:

- **Q.** Describe various modes of failure of earthen dams / causes of failure of earthen dams. **(SUMMER 2022, 7 Marks; WINTER 2022, 7 Marks; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks; SUMMER 2026, 7 Marks OR)**
- **Q.** Explain: (1) Rolled fill dam (2) Hydraulic fill dam. **(WINTER 2022, 3 Marks OR; SUMMER 2026, 4 Marks OR)**

5. Gravity Dams:

- **Q.** Discuss various forces acting on a gravity dam with a neat sketch. [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks; WINTER 2022, 7 Marks OR; WINTER 2023, 4 Marks; WINTER 2025, 4 Marks; SUMMER 2026, 7 Marks)**
- **Q.** Write a short note on contraction joints in a dam. **(SUMMER 2022, 3 Marks; WINTER 2023, 4 Marks)**

Other Important Questions:

1. Gravity Dams (Theory):

- **Q.** Explain (i) Gravity force and (ii) Earthquake forces acting on a gravity dam. **(WINTER 2025, 4 Marks)**
- **Q.** Explain Stability Requirement of gravity dam. **(WINTER 2024, 7 Marks OR)**

- **Q.** Discuss the effect of earthquake on a gravity dam. How to determine inertia force and hydrodynamic force. **(SUMMER 2023, 7 Marks)**
- **Q.** What is Spillway and explain Ogee Spillway. **(WINTER 2024, 3 Marks OR)**

2. Earthen Dams (Theory):

- **Q.** Explain with a neat sketch the components of a zoned embankment dam, with their functions. [Diagram required – refer to the original question paper] **(SUMMER 2026, 4 Marks)**
- **Q.** Explain phreatic line in an earthen dam. **(WINTER 2022, 3 Marks)**
- **Q.** Discuss seepage control measures of water through embankment and its foundation. **(SUMMER 2024, 7 Marks OR)**
- **Q.** Draw typical section of an earthen dam of 26 m height indicating the various parts of the dam. [Diagram required – refer to the original question paper] **(SUMMER 2023, 7 Marks OR)**
- **Q.** What are the modes of failure of an earthen dam? Explain how to ensure safety against each mode. **(SUMMER 2023, 7 Marks)**
- **Q.** Discuss in brief the causes and failure of earthen dams. **(WINTER 2023, 7 Marks)**

3. Seepage Theories for Weirs and Silt Theory (Theory):

- **Q.** How does Lane's weighted creep theory differ from Bligh's creep theory? How creep length is to be determined in both the theories. **(SUMMER 2023, 4 Marks)**
- **Q.** What are Drawback of Lacey's silt theory? **(WINTER 2024, 4 Marks)**

4. Miscellaneous (as placed in source):

- **Q.** Describe different methods of prevention of Water logging. **(WINTER 2025, 7 Marks OR)**
- **Q.** Explain (i) Capacity factor and (ii) Time factor. **(WINTER 2025, 4 Marks)**

5. Numerical Problems – Weirs and Channel Design:

- **Q.** Design an irrigation channel to carry a discharge of 4.90 Cumecs. Take m = 1.1, N = 0.0224 and B/D Ratio 4.50. **(WINTER 2025, 7 Marks)**
- **Q.** An impervious floor of a weir on permeable soil is 18 m long and has sheet piles at both the ends. The upstream pile is 4.5 m deep and the downstream pile is 6 m deep. The weir creates a net head of 3 m. Neglecting the thickness of the weir floor; calculate the uplift pressures at the junction of the inner face of the u/s pile with the weir floor, by using Khosla's theory. **(WINTER 2022, 7 Marks)**
- **Q.** Weir is constructed to store 5 m of water on a 23 m horizontal floor. 6.50 m deep upstream and 7 m deep downstream piles are provided. Calculate floor thickness and uplift pressure at a point 10 m and 16 m away from the upstream end. Assume sp.gr of floor material = 2.24. Adopt Bligh's theory. **(SUMMER 2023, 7 Marks)**

6. Numerical Problems – Gravity Dams:

- **Q.** A gravity dam 60.00 m high had 6.50 m top width. Upstream face of dam is vertical. Base width is 46.50 m. Downstream face is inclined from top of the dam. Calculate self weight of the dam and moment @ toe of the dam. Take sp weight of dam material and water equals to 24 kN/m^3 and 10 kN/m^3. **(SUMMER 2023, 7 Marks)**
- **Q.** A gravity dam stores 70 m of water on upstream side and there is 10 m of water on downstream side. Base width of dam is 60 m and drainage gallery is located 12 m away from heel. Draw uplift pressure diagram and calculate total uplift force and its moment about toe. [Diagram required – refer to the original question paper] **(SUMMER 2023, 7 Marks OR)**
- **Q.** What is meant by limiting height of a gravity dam? Determine limiting height of a concrete gravity dam for (i) Allowable stress in concrete 3000 kN/m^2 (ii) Specific gravity of concrete 2.4 and (iii) Specific weight of water 10 kN/m^3. **(SUMMER 2023, 4 Marks OR)**

Module 3 – Distribution Works (Canals)

Repeated Questions:

1. Classification and Alignment of Canals:

- **Q.** Give classification of irrigation canals based on alignment / classification of canals. **(WINTER 2022, 3 Marks; WINTER 2024, 7 Marks; SUMMER 2025, 7 Marks; SUMMER 2026, 4 Marks OR)**
- **Q.** What are the factors that affect alignment of a canal? / Write a short note on Alignment of canal. **(WINTER 2022, 4 Marks OR; SUMMER 2023, 4 Marks OR; WINTER 2023, 3 Marks OR; SUMMER 2024, 4 Marks OR)**
- **Q.** Explain Spoil bank and dowla for canals / Counterberm and Freeboards in canals / Berm and Spoil Banks. **(SUMMER 2022, 4 Marks; SUMMER 2026, 3 Marks; SUMMER 2026, 3 Marks OR)**
- **Q.** Enlist / Explain Balanced depth of canal and how it is determined. **(SUMMER 2023, 7 Marks; SUMMER 2024, 4 Marks; SUMMER 2025, 3 Marks; WINTER 2025, 3 Marks)**

2. Design of Channels – Kennedy's and Lacey's Theories:

- **Q.** Explain the procedure / salient features / stepwise procedure for designing an alluvial channel using Kennedy's theory. (Limitations of Kennedy's theory). **(SUMMER 2022, 7 Marks OR; WINTER 2022, 7 Marks; WINTER 2023, 7 Marks OR; WINTER 2024, 7 Marks OR; SUMMER 2025, 7 Marks OR)**
- **Q.** Explain the procedure of designing a channel using Lacey's theory. **(WINTER 2022, 7 Marks OR)**
- **Q.** Comparison between Kennedy's and Lacey's theory / Give difference between Kennedy's and Lacey's method. **(WINTER 2025, 7 Marks; SUMMER 2026, 4 Marks)**

3. Canal Lining and Losses:

- **Q.** Give necessity of lining in canal / Advantages and disadvantages / Types of canal lining. **(SUMMER 2022, 4 Marks; WINTER 2022, 3 Marks; SUMMER 2023, 3 Marks; WINTER 2023, 4 Marks; WINTER 2024, 3 Marks; SUMMER 2025, 4 Marks; SUMMER 2026, 3 Marks)**
- **Q.** Explain various types of canal lining and necessity of canal lining. **(SUMMER 2025, 4 Marks; SUMMER 2026, 3 Marks)**
- **Q.** Discuss losses in canals / Write a note on losses in canal. **(WINTER 2022, 3 Marks OR; SUMMER 2026, 3 Marks OR)**

4. Silt Control and Sediment Transport:

- **Q.** List out various devices used to reduce silt entry onto off-taking channel. Discuss King's vanes and Gibb's groyne wall in detail. **(SUMMER 2022, 3 Marks OR; SUMMER 2024, 7 Marks)**
- **Q.** Differentiate between suspended load and bed load. **(SUMMER 2023, 3 Marks; SUMMER 2025, 3 Marks)**

Other Important Questions:

1. Canal Section and Regime Concepts (Theory):

- **Q.** Draw a neat and clean sketch of canal section partially in cutting and partially in filling. Enlist components of a canal section. [Diagram required – refer to the original question paper] **(WINTER 2025, 4 Marks)**
- **Q.** Explain following terms for canal cross-section: (1) Side slopes (2) Borrow pit. **(WINTER 2023, 3 Marks)**
- **Q.** Explain Lacey's concept of initial, final, and permanent regime. **(SUMMER 2025, 3 Marks OR)**

2. Numerical Problems – Unlined (Earthen) Channels:

- **Q.** Design an irrigation channel to carry discharge 5 cumecs. Take m = 1.0, N = 0.0225, and B/D ratio = 4.40. **(WINTER 2023, 7 Marks OR)**
- **Q.** Design trapezoidal canal to carry a 5 m^3/sec of water using Lacey's theory. Take silt factor equal to 1. Also determine bed slope. **(SUMMER 2023, 7 Marks OR)**

- **Q.** Calculate the balancing depth of a channel section having bed width equal to 12 m and side slopes of 1:1 in cutting and 2.25:1 in filling. The bank embankments are kept 2.40 m higher than the ground level and crest width of bank is kept as 1.50 m. **(SUMMER 2023, 7 Marks)**
- **Q.** An earthen channel with a base 3 m wide and side slope 1:1 carries water with a depth of 1 m. The bed slope is 1:1600. Estimate the discharge. Take value of N in Manning's formula N = 0.04. **(SUMMER 2025, 4 Marks)**
- **Q.** A trapezoidal channel has side slope 1:2 (H:V) and the slope of bed is 1 in 1500. The area of the section is 40. Find the dimensions and discharge of most economical section, if C = 50. **(SUMMER 2025, 7 Marks OR)**

3. Numerical Problems – Lined Channels:

- **Q.** Design lined trapezoidal shaped concrete canal in a section to carry a discharge of 350 cumec at a slope of 20 cm/km. Take Manning's coefficient as 0.017, side slope of 1.5:1 and B/D = 4. **(SUMMER 2022, 7 Marks OR)**
- **Q.** Design trapezoidal concrete canal for following data: a. Design discharge 225 m^3/sec b. Bed slope 1 in 2500 c. Side slope 1:1 d. B/D ratio 4.20. e. Manning's Coefficient 0.015. **(SUMMER 2023, 7 Marks OR)**
- **Q.** Design lined concrete channel, trapezoidal in section to carry a discharge of 300 cumec at a slope of 35 cm/km. The Manning's coefficient is 0.015 and side slopes are 1.5:1. Take limiting velocity is 1.5 m/sec. **(SUMMER 2024, 7 Marks)**

Module 4 – Regulating and Cross Drainage Works

Repeated Questions:

1. Falls in Canals:

- **Q.** What is a Fall in canal structure? Why is it necessary to provide a fall in a canal? Enumerate / explain different types of falls. **(WINTER 2022, 4 Marks; SUMMER 2023, 3 Marks; WINTER 2024, 3 Marks; WINTER 2024, 4 Marks; WINTER 2025, 4 Marks OR; SUMMER 2026, 3 Marks OR)**
- **Q.** Write a note on Notch type fall. **(WINTER 2022, 4 Marks; SUMMER 2026, 4 Marks)**

2. Cross Drainage Works:

- **Q.** Describe various types of cross drainage works with neat sketches / Aqueduct and super passage. [Diagram required – refer to the original question paper] **(WINTER 2022, 4 Marks; SUMMER 2023, 7 Marks OR; SUMMER 2024, 3 Marks OR; WINTER 2024, 7 Marks; WINTER 2024, 7 Marks OR; WINTER 2025, 7 Marks; SUMMER 2026, 7 Marks)**
- **Q.** Differentiate between: (1) Aqueduct and super passage (2) Syphon aqueduct and canal siphon. **(SUMMER 2022, 4 Marks OR; WINTER 2022, 4 Marks)**

3. Regulators, Outlets and Escapes:

- **Q.** Describe Cross Regulator and Head Regulator with its function / Functions of distributive head regulator and cross regulator. **(SUMMER 2022, 3 Marks; WINTER 2022, 3 Marks; WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks OR; WINTER 2024, 3 Marks OR; WINTER 2025, 7 Marks OR; SUMMER 2026, 7 Marks OR)**
- **Q.** Define canal outlet. Explain any one type / Requirements of a good canal outlet / Distinguish between non-modular and semi-modular outlet. **(SUMMER 2022, 3 Marks OR; WINTER 2022, 3 Marks OR; WINTER 2023, 3 Marks OR; WINTER 2023, 3 Marks OR; SUMMER 2024, 4 Marks; SUMMER 2026, 3 Marks)**
- **Q.** Explain canal escape and its function / Write a note on canal escape / Types of escapes. **(WINTER 2022, 4 Marks OR; WINTER 2023, 7 Marks OR; WINTER 2025, 3 Marks; SUMMER 2026, 4 Marks OR)**

Other Important Questions:

1. Falls (Other):

- **Q.** Discuss the various considerations according to which the location of fall is decided. **(WINTER 2023, 3 Marks)**

2. Regulation and Silt Control Works (Other):

- **Q.** Discuss functions of head regulator and cross regulator. **(SUMMER 2026, 7 Marks OR)**
- **Q.** Explain various Regulation Work on Canal. **(WINTER 2024, 4 Marks OR)**
- **Q.** State function of following canal regulatory works: (1) King's vanes (2) Curved wings (3) Bed bars. **(SUMMER 2022, 3 Marks OR)**
- **Q.** Write a brief note on Parshall flume. **(SUMMER 2022, 3 Marks OR)**
- **Q.** Write a brief note on silt ejector. **(SUMMER 2024, 3 Marks)**

Module 5 – Water Logging and Land Reclamation

Repeated Questions:

1. Water Logging:

- **Q.** What is water logging? Explain ill effects of water logging / Causes and preventive measures / remedial measures. **(SUMMER 2022, 7 Marks OR; SUMMER 2023, 3 Marks; WINTER 2023, 4 Marks; SUMMER 2024, 3 Marks; WINTER 2024, 3 Marks; WINTER 2024, 4 Marks; WINTER 2025, 4 Marks; SUMMER 2026, 7 Marks OR)**

2. Land Reclamation:

- **Q.** Define land reclamation. Explain measures adopted for land reclamation / Write a note on land reclamation. **(WINTER 2022, 7 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks OR; WINTER 2024, 4 Marks OR; SUMMER 2026, 7 Marks)**

3. Drainage Systems:

- **Q.** Discuss various drainage systems used for effective control of water logging / Give advantage of open drains. **(SUMMER 2022, 4 Marks; WINTER 2024, 3 Marks OR)**

Other Important Questions:

1. Drainage and Command Area Development:

- **Q.** Enumerate the sign of bad drainage condition of an area. **(SUMMER 2025, 3 Marks)**
- **Q.** Objectives of command area development and how are these achieved through command area development programmes? **(SUMMER 2025, 7 Marks OR)**

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