

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BACHELOR OF ENGINEERING – SEMESTER 7 – EXAMINATION – SUMMER 2026**

**Subject Code: 3170621**

**Date: 08/06/2026**

**Subject Name: Design of hydraulic structures**

**Time: 02:30 PM TO 05:00 PM**

**Total Marks: 70**

**Instructions:**

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**
- 4. Simple and non-programmable scientific calculators are allowed.**

- Q.1**
- (a)** What are the main types of dams classified based on their structure and design? **03**
  - (b)** Differentiate between high gravity dam and low gravity dam. **04**
  - (c)** Explain the role of site investigation and subsurface exploration in dam foundation treatment. **07**

- Q.2**
- (a)** What is a cofferdam? how does it assist during dam construction? **03**
  - (b)** Describe the typical failure modes of gravity dams and how design prevents them. **04**
  - (c)** Discuss the temperature control measures used to prevent cracking in mass concrete gravity dams. **07**

OR

- Q.2**
- (c)** Explain the various forces acting on a gravity dam and how they affect the dam's stability. **07**

- Q.3**
- (a)** Analyze how uplift pressure is distributed along the base of a gravity dam. **03**
  - (b)** Evaluate the pros and cons of using roller-compacted concrete in gravity dam construction. **04**
  - (c)** Explain the method of determining stresses in the base of a gravity dam and their allowable limits. **07**

OR

- Q.3**
- (a)** Explain the design considerations of the impervious core in earth dams. **03**
  - (b)** Describe the construction sequence and compaction methods used in earth dam construction. **04**
  - (c)** Discuss the typical causes of failure in earth dams and suggest preventive measures. **07**

- Q.4**
- (a)** Discuss the benefits and limitations of using rock-fill dams in seismic zones. **03**
  - (b)** Assess the effectiveness of cutoff walls in controlling seepage under embankment dams. **04**
  - (c)** Using flow net analysis, explain how seepage quantity is calculated through an embankment dam. **07**

OR

- Q.4**
- (a)** Analyze the role of pore water pressure in slope stability of earth dams. **03**
  - (b)** Analyze the influence of foundation soil properties on the behavior of earth dams. **04**

|            |                                                                                                              |    |
|------------|--------------------------------------------------------------------------------------------------------------|----|
|            | (c) Analyze the impact of spillway discharge on downstream erosion and suggest mitigation methods.           | 07 |
| <b>Q.5</b> | (a) Assess the role of aeration galleries in mitigating cavitation damage and improving spillway durability. | 03 |
|            | (b) Evaluate the advantages and disadvantages of gated spillways compared to ungated spillways.              | 04 |
|            | (c) Explain the energy dissipation by hydraulic jump in hydraulic structures.                                | 07 |
|            | OR                                                                                                           |    |
| <b>Q.5</b> | (a) Explain how tailwater depth variations influence the efficiency of energy dissipation.                   | 03 |
|            | (b) Evaluate the effectiveness of different types of spillway gates in flood control operations.             | 04 |
|            | (c) Design a stilling basin by assuming suitable data related to flow, velocity and tailwater conditions.    | 07 |

\*\*\*\*\*