GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering - SEMESTER - IV EXAMINATION - SUMMER 2025

Subject Code: 3140611   **Date: 19-05-2025**

Subject Name: **Fluid Mechanics & Hydraulics**

Time:10:30 AM TO 01:00 PM   **Total Marks: 70**

Instructions
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

		Marks
Q.1	**(a)** Define: Mass density, Specific weight and Specific gravity	**03**
	(b) Explain different types of Equilibrium of floating body.	**04**
	(c) Explain different types of pressure-measuring devices with neat sketches.	**07**
Q.2	**(a)** Define the terms Buoyancy, Metacentre and Metacentric height.	**03**
	(b) What is a hydrostatic paradox? Explain with an example.	**04**
	(c) Derive the expression for total pressure for a vertical plate submerged in the liquid.	**07**

OR

	(c) A vertical rectangular gate is 2 m wide and 4 m high. It is submerged in water with the top edge at the water surface. Find the total hydrostatic force on the gate and the position of the center of pressure.	**07**
Q.3	**(a)** What are hydraulic coefficients of orifices? Define and explain them.	**03**
	(b) Explain Reynolds number. Discuss its significance.	**04**
	(c) Derive Bernoulli's equation for fluid flow and mention assumptions made.	**07**

OR

	(a) What are streamlines and flow nets? Give their practical importance.	**03**
	(b) Describe the phenomenon of water hammer and its effects.	**04**
	(c) A horizontal venturimeter with inlet and throat diameters 40 cm and 20 cm respectively is used to measure rate of water. The reading of differential manometer connected to the venturimeter is 15 cm of mercury. Determine the rate of flow. Take coefficient of discharge equal to 0.98.	**07**
Q.4	**(a)** Derive an expression for velocity measurement using a Pitot tube.	**03**
	(b) Explain the concept of specific energy in open channel flow with a diagram.	**04**
	(c) Derive Hagen-Poiseuille's equation for laminar flow in a circular pipe.	**07**

OR

	(a) Draw velocity distribution in pipe flow and open channel flow.	**03**

(b) Discuss the significance of hydraulic gradient line (HGL) and Total energy line (TEL) in pipe flow analysis. **04**

(c) Enlist the major and minor loses in pipes. Derive the Darcy-Weisbach equation for calculating head loss due to friction. **07**

Q.5 (a) Differentiate between pipe flow and open channel flow. **03**

(b) Discuss geometric, kinematic, and dynamic similarity. **04**

(c) Prove that the most economical trapezoidal section has a hydraulic radius equal to half the depth. **07**

OR

(a) Derive the relation between critical depth and discharge for a rectangular channel. **03**

(b) What is dimensional homogeneity? Why is it important? **04**

(c) A trapezoidal channel section has a bed width 5.5 m laid at a bed slope of 1 in 2000. Side slope of the channel is 1H : 05V. Depth of flow in the channel is 2.00 m. Find the discharge in the channel. Take Manning's constant 0.015. **07**

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