

Enrollment No./Seat No.:

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**Bachelor of Engineering - SEMESTER - IV EXAMINATION - WINTER 2025**

**Subject Code: 3140611**

**Date: 24-11-2025**

**Subject Name: Fluid Mechanics & Hydraulics**

**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.**

	<b>Marks</b>
<b>Q.1 (a)</b> Define density, specific weight and specific gravity.	<b>03</b>
<b>(b)</b> Explain Buoyancy and Centre of Buoyancy.	<b>04</b>
<b>(c)</b> The velocity distribution for flow over a flat plate is given by $u = \frac{2}{3}y - y^2$ in which u is the velocity in meter per second at a distance y meter above the plate. Determine the shear stress at y = 0.15 m. Take dynamic viscosity of fluid as 8.6 poise.	<b>07</b>
<b>Q.2 (a)</b> Define the terms: (1) Velocity potential function and (2) Stream function.	<b>03</b>
<b>(b)</b> Explain the term velocity of approach. Find an expression for the discharge over a rectangular weir with velocity of approach.	<b>04</b>
<b>(c)</b> Describe Buckingham's $\pi$ theorem. How are the repeating variables selected for dimensional analysis?	<b>07</b>
<b>OR</b>	
<b>(c)</b> The efficiency $\eta$ of a fan depends on the density $\rho$ , dynamic viscosity $\mu$ , the angular velocity $\omega$ , Diameter D of the rotor and the discharge Q. Express $\eta$ in terms of dimensionless parameters.	<b>07</b>
<b>Q.3 (a)</b> Classify different types of orifices according to its size, shapes and discharge.	<b>03</b>
<b>(b)</b> What is pitot-tube? How the velocity at any point is determined with the help of pitot-tube.	<b>04</b>
<b>(c)</b> Derive an expression for the discharge through triangular notch.	<b>07</b>
<b>OR</b>	
<b>(a)</b> Define coefficient of contraction, coefficient of velocity and coefficient of discharge for the orifice.	<b>03</b>
<b>(b)</b> Write down the advantages of triangular notch over a rectangular notch.	<b>04</b>
<b>(c)</b> What is venturimeter. Derive an expression for the discharge through a venturimeter.	<b>07</b>

- Q.4** (a) Define: (i) Total energy line (ii) Hydraulic gradient line **03**
- (b) Derive an expression for loss of head due to sudden enlargement of a pipe. **04**
- (c) Derive an expression for the loss of head due to friction in pipes. **07**

**OR**

- (a) Describe major energy losses and minor energy losses in pipe. **03**
- (b) Explain the phenomenon of water hammer. **04**
- (c) Derive the Hagen-Poiseuille equation for laminar flow in the circular pipe. **07**
- Q.5** (a) Explain the terms (1) Rapidly varied flow and (2) Gradually varied flow. **03**
- (b) A rectangular channel of width 4.5 m is having a bed slope of 1 in 1500. Find the maximum discharge through the channel. Take value of  $C = 50$  **04**
- (c) Derive the geometrical conditions for the most economical section of a trapezoidal channel. **07**

**OR**

- (a) Differentiate between: (1) Uniform flow and non-uniform flow (2) Steady and unsteady flow. **03**
- (b) Find the velocity of flow and rate of flow of water through a rectangular channel of 6.5 m wide and 3 m deep, when it is running full. The channel is having bed slope as 1 in 2000. Take Chezy's constant  $C = 55$ . **04**
- (c) Draw specific energy curve and then derive expressions for critical depth and critical velocity. **07**

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