

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.

	Marks
Q.1 (a) Define density, specific weight and specific gravity.	03
(b) Explain Buoyancy and Centre of Buoyancy.	04
(c) 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.	07
Q.2 (a) Define the terms: (1) Velocity potential function and (2) Stream function.	03
(b) Explain the term velocity of approach. Find an expression for the discharge over a rectangular weir with velocity of approach.	04
(c) Describe Buckingham's π theorem. How are the repeating variables selected for dimensional analysis?	07

OR

(c) The efficiency η of a fan depends on the density ρ , dynamic viscosity μ , the angular velocity ω , Diameter D of the rotor and the discharge Q . Express η in terms of dimensionless parameters.	07
Q.3 (a) Classify different types of orifices according to its size, shapes and discharge.	03
(b) What is pitot-tube? How the velocity at any point is determined with the help of pitot-tube.	04
(c) Derive an expression for the discharge through triangular notch.	07

OR

(a) Define coefficient of contraction, coefficient of velocity and coefficient of discharge for the orifice.	03
(b) Write down the advantages of triangular notch over a rectangular notch.	04
(c) What is venturimeter. Derive an expression for the discharge through a venturimeter.	07

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**
