

Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering - SEMESTER - V EXAMINATION - WINTER 2025

Subject Code: 3152003

Date: 25-11-2025

Subject Name: Fluid Mechanics & Machines

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.**
- 4. Simple and non-programmable scientific calculators are allowed.**

	Marks
Q.1 (a) Define following terms: Newtonian fluid, Kinematic Viscosity, Surface tension.	03
(b) State and explain Newton's law of viscosity	04
(c) What is Meta-Center? Derive equation for Meta-Centric height of floating body	07
Q.2 (a) State hydrostatic law.	03
(b) Describe conditions of equilibrium for submerged bodies.	04
(c) A 1m wide and 1.5 m deep rectangular plane surface lies in water in such a way that its plane makes an angle of 30° with the free water surface. Determine the total pressure and position of centre of pressure when the upper edge is 0.75 m below the free water surface.	07
OR	
(c) What is cavitation? What are its causes? How will you prevent Cavitation in centrifugal pump?	07
Q.3 (a) Define Stream-lines, Path-lines and streak lines in a fluid flow.	03
(b) List Major and Minor head losses in a pipe flow.	04
(c) State and derive Bernoulli's theorem, state its application and assumptions made.	07
OR	
(a) State & Explain Pascal's Law	03
(b) Discuss the stability of submerged body and floating body with neat sketch.	04
(c) Derive Darcy-Weisbach equation for the loss of head due to friction in pipes	07
Q.4 (a) Give the Classification of Pumps.	03
(b) Explain Laminar boundary layer theory over a flat plate	04
(c) What is an air vessel? Explain with a neat sketch the working of air vessels in a reciprocating pump	07
OR	
(a) Explain following terms: Priming, slip factor, Pre-whirl	03

- (b) Explain difference between impulse and reaction turbine. 04
- (c) A centrifugal pump is running at 500 rpm and discharging 8 m³ /min against a head of 10 m. It has an impeller of 50 cm outer diameter and 25 cm inner diameter. Vanes are set back at outlet at an angle of 45 degree .The constant velocity of flow is 2 m/s. Calculate i) The manometric efficiency
ii) Vane angle at inlet. 07

- Q.5**
- (a) Draw the neat sketch of pelton wheel turbine 03
 - (b) State function of draft tube and explain with neat sketch different types of draft tubes 04
 - (c) A Pelton wheel is having a mean bucket diameter of 1 m and is running at 1000 r.p.m. The net head on the Pelton wheel is 700 m. If the side clearance angle is 15° and discharge through nozzle is 0.1 m³/s, find (i) Power available at the nozzle, and (ii) Hydraulic efficiency of the turbine. 07

OR

- (a) Write classification of Centrifugal pump. 03
- (b) State advantages and disadvantages of Francis turbine over Pelton turbine 04
- (c) A centrifugal pump having 36cm outlet diameter and 18 cm inlet diameter is to deliver water against a net head of 25cm at 1200 rpm. The width of impeller at outlet is 6cm and flow velocity is constant from inlet to outlet. The entry is radial and the impeller vanes are bent back at 30° to the tangent at outlet. Taking manometric efficiency 90%, determine the width of impeller at inlet, the angle of vane tip at inlet and the discharge from the pump. 07
