

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-V (NEW) EXAMINATION – WINTER 2024****Subject Code:3152003****Date:05-12-2024****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) Explain the following terms: Density, Dynamic Viscosity, Surface tension	03
	(b) State & Explain Pascal's Law	04
	(c) What is Archimedes' principle? Explain Conditions for floating with neat sketch.	07
Q.2	(a) What is Meta-Center? What is Meta-Centric height?	03
	(b) Discuss the stability of submerged body and floating body with neat sketch.	04
	(c) Derive equations for total force and centre of pressure for a Vertical plane surface immersed in a static liquid.	07
	OR	
	(c) What is Continuity Equation? Derive Continuity Equation for three dimensions.	07
Q.3	(a) Differentiate between: (i) Uniform flow and Non-uniform flow	03
	(b) Define Stream-lines, Path-lines and streak lines in a fluid flow.	04
	(c) Derive Euler's equation of motion along a streamline and hence obtain Bernoulli's equation clearly state the assumption made	07
	OR	
Q.3	(a) What do you understand by laminar flow and turbulent flow?	03
	(b) Describe the types of fluid flow.	04
	(c) State and derive Bernoulli's theorem, state its application and assumptions made.	07
Q.4	(a) Explain boundary layer theory.	03
	(b) List Major and Minor head losses in a pipe flow.	04
	(c) Derive Darcy – Weisbach equation for the loss of head due to friction in pipes	07
	OR	
Q.4	(a) What is Reynold number. Explain Reynold experiment with neat sketch.	03
	(b) Explain function of components of Pelton turbine	04
	(c) Define Specific speed of a centrifugal pump & derive the expression for the same	07
Q.5	(a) Explain the types of pump.	03
	(b) Explain Stalling and surging phenomena.	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	07

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.

OR

- Q.5**
- (a)** Explain impulse and reaction turbine. **03**
 - (b)** State function of draft tube and explain with neat sketch different Types of draft tubes. **04**
 - (c)** A Kaplan turbine runner is to be designed to develop 7357.5 kW shaft power. The net available head is 5.50 m. Assume that the speed ratio is 2.09 and flow ratio is 0.68 and the overall efficiency is 60%. The diameter of the boss is $1/3^{\text{rd}}$ of the diameter of the runner; find the diameter of runner, its speed and its specific speed. **07**
