

GUJARAT TECHNOLOGICAL UNIVERSITY**BE – SEMESTER- V EXAMINATION-SUMMER 2023****Subject Code: 3152003****Date: 28/06/2023****Subject Name: Fluid Mechanics & Machines****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 following terms: Specific Gravity, Kinematic Viscosity, Surface tension	03
	(b) Explain Hydrostatic Law.	04
	(c) What is Meta-Center? Derive equation for Meta-Centric height of floating body.	07
Q.2	(a) Define Stream-lines, Path-lines and streak lines.	03
	(b) Classify the fluid flow.	04
	(c) Obtain the equation to the stream lines for the velocity field given as: $V = 2x^3 i - 6x^2 y j$	07
	OR	
	(c) Derive expressions for total force and centre of pressure on a vertical plane surface submerged in static liquid	07
Q.3	(a) State and explain Newton's law of viscosity.	03
	(b) What is Archimedes' principle? State Conditions for floating with neat sketch.	04
	(c) State and derive Bernoulli's theorem, state its application and assumptions made.	07
	OR	
Q.3	(a) Define Atmospheric, Gauge, Absolute and negative pressure with neat sketch.	03
	(b) Discuss the stability of submerged body and floating body with neat sketch.	04
	(c) Derive Continuity equation in polar co-ordinates	07
Q.4	(a) What is slip of reciprocating pump? What do you mean by negative slip?	03
	(b) Classify the pumps.	04
	(c) A centrifugal pump is running at 500 rpm and discharging $8 \text{ m}^3/\text{min}$ 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° . The constant velocity of flow is 2 m/s. Calculate i) The manometric efficiency ii) Vane angle at inlet.	07
	OR	
Q.4	(a) Draw neat sketch of Pelton wheel turbine.	03
	(b) Explain difference between impulse and reaction turbine.	04

- (c) A Pelton wheel produces 80000 kW under a head of 625 m, and runs at a speed of 300 rpm. Assuming speed ratio of 0.48 and coefficient of velocity 0.98, find jet diameter, runner diameter and number of buckets. The turbine is double overhung type and has single jet per runner. Take overall efficiency to be 0.88. **07**
- Q.5** (a) What is Reynold's Number? Write Reynold's Number related to laminar flow and turbulent flow. **03**
- (b) List Major and Minor head losses in a pipe flow **04**
- (c) Derive the expression for the loss of head due to Friction in pipe flow (Darcy Equation). **07**
- OR**
- Q.5** (a) Explain draft tube and its importance **03**
- (b) Explain Stalling and surging phenomena. **04**
- (c) State and Derive Hagen Poiseuille law. **07**
