Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–IV (NEW) EXAMINATION – WINTER 2024

Subject Code:3140110 Date:19-11-2024

Subject Name: Fluid Mechanics

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.**

Q.1	**(a)**	Define the following fluid properties: Density, Specific Volume and specific gravity of a fluid.	**03**
	(b)	Define and explain Newton's law of viscosity.	**04**
	(c)	Explain the phenomenon of capillarity. Obtain an expression for capillary rise of a liquid	**07**
Q.2	**(a)**	What do you understand by 'Total Pressure' and 'Centre of Pressure'?	**03**
	(b)	The pressure outside the droplet of water of diameter 0.04 mm is 10.32 N/cm^2 (at atmospheric pressure). Calculate the pressure within the droplet if surface tension is given as 0.0725 N/m of water.	**04**
	(c)	State and prove the Pascal's law	**07**
		OR	
	(c)	Derive an expression for the force exerted on a sub-merged vertical plane surface by the static liquid and locate the position of Centre of pressure.	**07**
Q.3	**(a)**	What do you understand by Hydrostatic Law?	**03**
	(b)	What are the conditions of equilibrium of a floating body and a sub-merged body?	**04**
	(c)	A 30 cm diameter pipe, conveying water, branches into two pipes of diameter 20 cm and 15 cm respectively. If the average velocity in the 30 cm diameter pipe is 2.5 m/s, find the discharge in this pipe. Also determine the velocity in 15 cm pipe, if average velocity in 20 cm diameter pipe is 2 m/s.	**07**
		OR	
Q.3	**(a)**	Distinguish between rotational flow and irrotational flow. Give one example of each.	**03**
	(b)	Delfine the followings and give one practical example for each: (1) Laminar flow (2) Turbulent flow (3) Steady flow (4) Uniform flow	**04**
	(c)	Explain uniform flow with source and sink. Obtain expressions for stream and velocity potential functions.	**07**
Q.4	**(a)**	Distinguish between a source and a sink.	**03**
	(b)	Derive Bernoulli's equation from Euler's equation and explain each term.	**04**
	(c)	With neat sketch explain the function and working of Pitot static tube.	**07**
		OR	
Q.4	**(a)**	What is CFD? Mention steps involved in CFD.	**03**
	(b)	Discuss the relative merits and demerits of venturimeter with respect to orifice-meter	**04**
	(c)	What is Hagen Poiseuille's Formula? Derive an expression for the same.	**07**

Q.5	**(a)**	How are the weirs and notches classified?	**03**
	(b)	State Buckingham's π theorem. What do you mean by repeating variables? How are the repeating variables selected in dimensional analysis?	**04**
	(c)	With neat sketch explain the physical significance of displacement, momentum, and energy thicknesses	**07**

OR

Q.5	**(a)**	What do you understand by turbulent Flew? What factor decides the type of flow in pipes?	**03**
	(b)	How lift is produced on airfoil?	**04**
	(c)	Explain Darchy-Weishbach equation for coefficient of friction in detail.	**07**

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