GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–IV EXAMINATION – WINTER 2025

Subject Code:3140110   **Date:13-11-2025**

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.**

			MARKS
Q.1	**(a)**	Define: Surface tension, Specific gravity and Specific volume	**03**
	(b)	Define steady and unsteady flow and laminar and turbulent flow.	**04**
	(c)	Explain the condition of equilibrium of submerged bodies with neat sketches.	**07**
Q.2	**(a)**	Define Buoyancy and Centre of Buoyancy	**03**
	(b)	With the neat sketch explain the working and use of Pitot Tube.	**04**
	(c)	Derive Euler's equation of motion along a streamline for an ideal fluid and obtain from it Bernoulli's equation. State all the assumptions made.	**07**
		OR	
	(c)	Derive expression of potential function and stream function for source flow.	**07**
Q.3	**(a)**	Define Source, Sink and Doublet.	**03**
	(b)	What is the difference between U-tube differential manometers and inverted U-tube differential manometer? Where are they used?	**04**
	(c)	The following cases represent the two velocity components. Determine the third component of velocity such that they satisfy the continuity equation.	**07**

$(i)\ u = x^2 + y^2 + z^2 , \ v = xy^2 - yz^2 + xy$

$(ii)\ v = 2y^2 , \ w = 2xyz$

<div align="center">OR</div>

Q.3	**(a)**	Given velocity field $=5x3\hat{\imath}-15x2y\hat{\jmath}$; obtain the equation of stream line.	**03**
	(b)	Describe the terms atmospheric, absolute, gauge and vacuum pressure with neat sketch.	**04**
	(c)	Establish a relation for the average and maximum velocity for one-dimensional viscous flow of fluid between two fixed parallel plates.	**07**
Q.4	**(a)**	Compare rectangular and triangular notches.	**03**
	(b)	Define (l) boundary layer, (ii) boundary layer thickness, (iii) displacement thickness, and (iv) momentum thickness	**04**
	(c)	Derive Darcy-Weisbach equation for loss of head due to: friction in pipes.	**07**
		OR	
Q.4	**(a)**	Explain, with examples, (i) vortex flow, (ii) forced vortex flow, and (iii) free vortex flow.	**03**
	(b)	Explain the role of computational fluid dynamics in the applications of fluid mechanics.	**04**
	(c)	Obtain an expression for velocity distribution in terms of average velocity for (i) smooth pipes, and (ii) rough pipes.	**07**

Q.5	(a)	State few engineering applications of momentum equation.	03
	(b)	Write short note on Frames of Reference.	04
	(c)	What is a venturimeter? Derive an expression for the rate of flow of fluid through it.	07

OR

Q.5	(a)	What is meant by Geometric, Kinematic and Dynamic similarities?	03
	(b)	Define: Path line, stream line, compressible and incompressible flow.	04
	(c)	State Hydrostatic law. Derive equation for variation of pressure vertically for a fluid under the gravity.	07

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