U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

April 2025 Semester End Make-Up Examinations

Programme: B.E. **Semester: III**

Branch: Chemical Engineering **Duration: 3 hrs**

Course Code: 23CH3PCFME/22CH3PCFME **Max Marks: 100**

Course:Fluid Mechanics

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Derive barometric equation for isothermal condition using the principles of hydrostatic equilibrium.	CO1	PO 2	**12**
	b)	An inverted U-tube manometer contains a liquid of density 700 kg/m^3 as the manometric fluid. It is connected across pipes X and Y, conveying liquids of sp.gr 1.2 and 1.0 and immiscible with manometric fluid. Pipes X and Y are located at the same level. The height of pipe 'X' from horizontal line is (h+300mm). Enumerate the differential reading 'h'.	CO1	PO3	**08**
		OR			
2	a)	Analyze the plot of shear stress versus velocity gradient for Newtonian and non-Newtonian fluids.	CO1	PO3	**10**
	b)	Explain Boundary layer separation and wake formation with a neat sketch.	CO1	PO 2	**10**
		UNIT - II			
3	a)	Derive Bernoulli's Equation from Newton's second law of motion.	CO3, CO 4	PO3	**10**
	b)	Water flows through the pipe PQ 0.6 m radius at 300 cm/s and then passes through pipe QR which is 0.75 m in radius. At point 'R' the pipe branches. Branch RS is 80 cm in diameter and carries 1/3rd of the flow in PQ. The flow velocity in branch RT is 250 cm/s. Find the discharge in PQ, velocity in QR, velocity in RS and diameter of the pipe RT.	CO3, 4	PO3	**10**
		OR			
4	a)	Water is flowing through a pipe of diameters 300 mm & 200 mm at the bottom and upper end respectively. The intensity of pressure at bottom end is 24.525N/cm^2 and the pressure at the upper end is 9.81 N/cm^2. Compute the difference in datum head if the rate of flow through the pipe is 40 lit/sec.	CO 3,4	PO3	**10**

		b)	Obtain the relation between friction factor and Reynolds number in laminar flow and describe the Friction factor chart with a neat sketch.	*CO 3,4*	*PO2*	**10**
			UNIT - III			
	5	a)	Define Mach number. Compare Sonic, Subsonic and Super Sonic flow.	*CO 3,4*	*PO2*	**10**
		b)	Derive an expression for stagnation pressure under adiabatic conditions for a compressible fluid.	*CO 3,4*	*PO 3*	**10**
			OR			
	6	a)	Derive the equation of continuity for compressible flow.	*CO 3,4*	*PO2*	**10**
		b)	Deduce the equation for velocity of sound for isothermal process.	*3,4*	*PO2*	**10**
			UNIT - IV			
	7	a)	Deduce the flow equation for a Venturi meter.	*CO2*	*PO2*	**12**
		b)	Explain the construction and working principal of a Pitot Tube.	*CO2*	*PO1*	**08**
			OR			
	8	a)	Describe the constructional details and working of an orifice meter.	*CO2*	*PO1*	**10**
		b)	Analyze the performance characteristic curves of a centrifugal pump.	*CO2*	*PO3*	**10**
			UNIT - V			
	9	a)	List the factors to be considered while selecting the repeating variables in Buckingham Π-method of dimensional analysis.	*CO4*	*PO1*	**08**
		b)	Using Buckingham π- method of dimensional analysis, show that the velocity through an orifice is, $V = \sqrt{2gH}\ \emptyset\left(\frac{D}{H}, \frac{\mu}{\rho VH}\right)$	*CO4*	*PO3*	**12**
			OR			
	10	a)	The pressure difference **ΔP** in a pipe of diameter **D** and length **L** due to viscous flow depends on the velocity **V**, viscosity **μ** and density **ρ.** Deduce a relation for pressure drop using Buckingham ∏ -theorem of dimensional analysis.	*CO4*	*PO3*	**12**
		b)	Discuss the significance of dimensionless numbers used in fluid flow phenomena.	*CO4*	*PO2*	**08**

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