U.S.N.										

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

Autonomous Institute Affiliated to VTU

April 2024 Semester End Main 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)	Provide a brief explanation of any four fluid properties.	CO1	CO1	08
	b)	State and derive the expression for variation of pressure with height under isothermal conditions in a static fluid, when the fluid is an (i) incompressible fluid (ii) compressible fluid	CO1	CO1	12
		OR			
2	a)	Explain Newtonian and non-Newtonian fluids with a graph of shear stress and velocity gradient.	CO1	CO1	10
	b)	An inclined tube manometer consists of a vertical cylinder 35 mm diameter. At the bottom of this is connected a tube 5mm in diameter inclined upward at an angle of 15 to the horizontal, the top of this tube is connected to an air duct. The vertical cylinder is open to the air and the manometric fluid has relative density 0.785. i. Determine the pressure in the air duct if the manometric fluid moved 50 mm along the inclined tube. ii. What is the error if the movement of the fluid in the vertical cylinder is ignored?	CO1	CO2	10
		UNIT - II			
3	a)	Derive the equation of continuity for an incompressible fluid.	CO3	PO3	10
	b)	Water is flowing through a tapered pipe of length 100 m having diameter 600 mm upper end and 300 mm at lower end. The rate of flow is 50 liter/s. Pipe has a slope of 1 in 30. If the upper end is 3.3 m above the datum line, find the pressure at the lower end, if the pressure at the higher level is 19.62×10^4 N/m^2.	CO2	PO3	10
		OR			
4	a)	Derive the Bernoulli's equation by stating all the assumptions made.	CO3	PO3	12
	b)	Gasoline (Sp. gravity 0.8) is flowing upwards through a vertical pipe line which tapers from 300 mm to 150 mm diameter. A gasoline mercury differential manometer is connected between	CO2	PO3	08

			300 mm and 150 mm pipe sections to measure the rate of flow. The distance between the manometer tapping is 1 meter and gauge reading is 500 mm of mercury. (a) Find the gauge reading in terms of gasoline head. (b) Using Bernoulli's equation and the equation of continuity, find the rate of flow. Neglect friction and other losses.			
			UNIT - III			
	5	a)	Present various basic equations used for compressible fluid flow.	***CO2***	***PO3***	**10**
		b)	Define Mach number. Provide the classification of flow based on mach number	***CO1***	***CO1***	**04**
		c)	An aeroplane is flying at 1000 km/h through still air having a pressure of 78.5 kN/m^2 (abs.) and temperature – 8°C. Calculate the stagnation point on the nose of the plane: (i) Stagnation pressure (ii) Stagnation temperature (iii) Stagnation density. Take for air: R = 287 J/kg K and γ = 1.4	***CO1***	***CO1***	**06**
			UNIT - IV			
	6	a)	Provide the different expressions used for efficiency of pumps.	***CO2***	***PO3***	**03**
		b)	Discuss about working principle and operation of centrifugal pump.	***CO2***	***PO3***	**10**
		c)	With the help of a schematic diagram and derivation, explain the working of a Pitot Tube.	***CO4***	***PO2***	**07**
			UNIT - V			
	7	a)	Define dimensional analysis. Describe Rayleigh's method with a suitable example	***CO3***	***PO2***	**10**
		b)	Using dimensional analysis, show that the torque due to friction developed over a disc rotating in a fluid is expressed as $T = D^5N^2\rho\phi$ [μ/ $D^2N\rho$], where, D is the diameter of the disc, N is the speed, μ is the viscosity and ρ is the density of fluid.	***CO3***	***PO2***	**10**

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