U.S.N.										

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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

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

Branch: Biotechnology **Duration: 3 hrs.**

Course Code: 23BT3PCFME / 22BT3PCFME **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)	The pressure loss due to friction for the flow of a fluid through a pipe depends on the following variables i) Diameter of the pipe (D) ii) Length of the pipe (L) iii) Velocity of the fluid (u) iv) Density of the fluid (ρ) v) Viscosity of the fluid(μ). Using Rayleigh method of dimensional analysis, obtain a relation between the pressure drop (ΔP) and the given variables.	*CO2*	*PO1*	**10**
	b)	State Newton's law of viscosity. Explain Newtonian and Non-Newtonian fluids with an example.	*CO2*	*PO1*	**10**
		OR			
2	a)	Derive an equation for hydrodynamic equilibrium of incompressible fluids.	*CO2*	*PO1*	**10**
	b)	Explain the concept of laminar and turbulent flow.	*CO2*	*PO1*	**05**
	c)	A U-tube mercury manometer is used to measure the pressure of water flowing in a pipeline. The mercury level of water in the arm connected to the pipeline is 50mm, find the pressure in the pipeline in N/m^2 and in terms of head of water. Density of water =1000 kg/m^3 Density of mercury =13600 kg/m^3	*CO2*	*PO1*	**05**
		UNIT - II			
3	a)	Derive the Bernoulli's equation with all correction factors by stating the assumptions made.	*CO2*	*PO1*	**14**
	b)	Prove that $f=16/N_{Re}$ for laminar flow through pipes.	*CO2*	*PO1*	**06**
		OR			
4	a)	Derive an expression for the velocity distribution of laminar flow of a Newtonian fluid through a circular pipe.	*CO2*	*PO1*	**10**

		b)	Crude oil of density 840 kg/m^3 is pumped at a rate of 3 L/s through a 52mm i.d. steel pipe under a pressure drop of 550 kPa over a length of 600m.Calculate the fanning friction factor using the Hagen-Poiseuille equation.	*CO3*	*PO2*	**10**
			UNIT - III			
	5	a)	Derive the flow equation for a venturi meter.	*CO2*	*PO1*	**10**
		b)	A rotameter tube with an internal diameter of 25 mm at the top and 20 mm at the bottom is 0.3 m long. The diameter of the float is 20 mm. Water flows through the rotameter. Calculate the flowrate of water when the float is halfway up the tube. **Data:** specific gravity of float material =4.80, density of Water= 1000 kg/m^3, volume of float =6.0 cm^3, coefficient of discharge =0.7	*CO3*	*PO2*	**10**
			OR			
	6	a)	With a neat diagram, explain construction and working of orifice meter.	*CO2*	*PO1*	**10**
		b)	Explain the following i) Cavitation ii) NPSH iii) Priming	*CO2*	*PO1*	**10**
			UNIT - IV			
	7	a)	Explain in detail laboratory batch settling test and discuss settling velocity curve.	*CO2*	*PO1*	**10**
		b)	With a neat diagram, explain the construction and working of rotary drum filter.	*CO2*	*PO1*	**10**
			OR			
	8	a)	A filter press is used to filter a sludge forming a nonuniform compressible cake. At a constant pressure difference ,6000 liter of filtrate is obtained in 1h. Washing is done with 1200 liter of water, it proceeds exactly as filtration. The filtrate has the same properties as the wash water. Neglecting the resistance of filter cloth, calculate the washing time required. The rate of washing is one fourth the final rate of filtration.	*CO3*	*PO2*	**10**
		b)	Discuss the following i) Hindered settling ii) Terminal settling velocity.	*CO1*	*PO1*	**10**
			UNIT - V			
	9	a)	Describe in detail the methods for the prevention of swirling and vortex formation with suitable illustrations.	*CO2*	*PO1*	**10**
		b)	Explain various types of propellers with a neat diagram.	*CO2*	*PO1*	**10**
			OR			
	10	a)	Explain the construction and working of ribbon blender with a neat diagram.	*CO2*	*PO1*	**10**
		b)	What is power number? Explain in detail the concept of power consumption in mixing operations.	*CO2*	*PO1*	**10**

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