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

Autonomous Institute Affiliated to VTU

September / October 2024 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: Mechanical Engineering **Duration: 3 hrs.**
Course Code: 19ME3DCFME **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)	State and explain Newton's law of viscosity.	CO1	PO1	**06**
	b)	State and explain Pascal's law.	CO1	PO1	**06**
	c)	Sketch and explain the working principle of a differential manometer.	CO1	PO1	**08**
		UNIT - II			
2	a)	Define center of pressure and total pressure for a body immersed in a liquid and obtain the same for a plane surface submerged in a liquid, inclined at angle 'θ' to the horizontal.	CO1	PO1	**10**
	b)	A circular plate 5 m in diameter is immersed in water in such a way such that its greatest and least depths below the water surface are 4 and 1.5 m respectively. Determine the total pressure on one face of the plate and the position of center of pressure.	CO1	PO2	**06**
	c)	Define buoyant force and center of buoyancy of a submerged body.	CO1	PO1	**04**
		UNIT - III			
3	a)	Derive the continuity equation for three dimensional flows.	CO2	PO1	**10**
	b)	A fluid flow field is given by $V=x^2yi+y^2zj-(2xyz+yz^2)$ k. Prove that it is a case of possible steady incompressible fluid flow. Calculate the velocity and acceleration at the point (2, 1, 3).	CO2	PO2	**10**
		OR			
4	a)	Obtain Euler's equation of motion along a streamline stating the assumptions.	CO2	PO1	**10**
	b)	Describe the working of a venturimeter with a neat sketch.	CO2	PO1	**05**
	c)	A pipe, through which water is flowing, is having diameters 20 cm and 10 cm at the cross sections 1 and 2 respectively. The velocity of water at section 1 is 4 m/s. find the velocity head at sections 1 and 2 and also rate of discharge.	CO2	PO2	**05**

			UNIT - IV			
	5	a)	Obtain an expression for force on a flat vertical plate moving in the direction of the jet.	*CO2*	*PO1*	**10**
		b)	A jet of water of diameter 10 cm strikes a flat plate normally with a velocity of 15 m/s. The plate is moving with a velocity of 6 m/s in the direction of the jet and away from the jet. Find (i) the force exerted by the jet on the plate (ii) work done by the jet on the plate per second. Also find power and efficiency of the jet.	*CO2*	*PO2*	**10**
			OR			
	6	a)	Enumerate the major and minor losses occurring in a pipe flow.	*CO2*	*PO3*	**06**
		b)	An oil of viscosity 0.1 Ns/m^2 and relative density 0.9 is flowing through a circular pipe of diameter 50 mm and of length 300 mm. The rate of flow of fluid through the pipe is 3.5 litres/s. Find the pressure drop in a length of 300 m and also the shear stress at the pipe wall.	*CO2*	*PO4*	**10**
		c)	Define the terms drag and lift.	*CO2*	*PO1*	**04**
			UNIT - V			
	7	a)	Explain dimensional homogeneity in fluid mechanics problems.	*CO3*	*PO1*	**04**
		b)	State and explain Rayleigh's method of dimensional analysis in brief.	*CO3*	*PO1*	**06**
		c)	The frictional torque of a disc of diameter, D rotating at a speed, N in a fluid of viscosity, μ and density, ρ in a turbulent flow is given by $T=D^5 N^2 \rho \phi (\mu/ D^2 N\rho)$. Prove this by the method of dimensions using Buckingham's theorem. Use 'D', 'N' and 'ρ' as repeating variables.	*CO3*	*PO2*	**10**

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