U.S.N.										

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

Autonomous Institute Affiliated to VTU

August 2024 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Aerospace Engineering **Duration: 3 hrs.**
Course Code: 22AS3PCFMS **Max Marks: 100**
Course: Fluid Mechanics Systems

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

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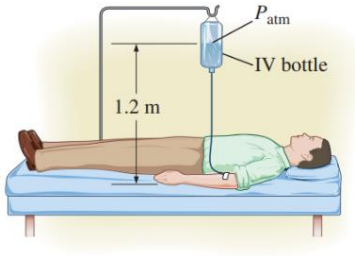
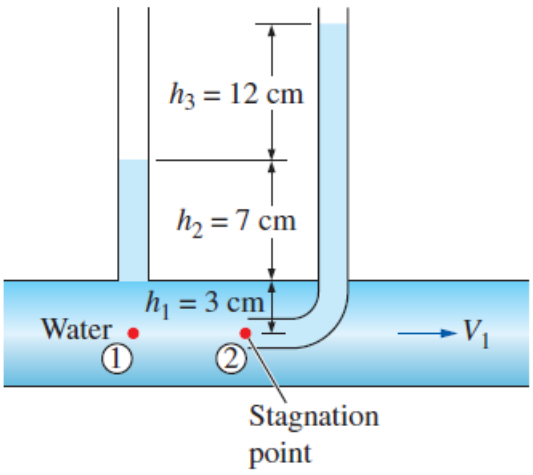
Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	Marks
1	a)	Define the following i) Specific weight ii) Buoyancy iii) Solids and fluids iv) Newtonian and non-Newtonian fluid v) Surface tension	CO 1	PO 1	**10**
	b)	If the velocity distribution over a plate is given by $\boldsymbol{u = y^2 - \frac{3}{2}y}$ in which u is in m/s at a distance y meter above the plate. Determine the shear stress at y = 0 m, y = 0.5 m and y = 1 m. Take dynamic viscosity as 0.863 N.s/m^2.	CO 1	PO 1 PO 2	**10**
		OR			
2	a)	i) Define viscosity and distinguish between dynamic viscosity and kinematic viscosity. ii) State and give an expression for Newton's law of viscosity with a neat sketch.	CO 1	PO 1	**10**
	b)	Intravenous infusions usually are driven by gravity by hanging the fluid bottle at sufficient height to counteract the blood pressure in the vein and to force the fluid into the body as shown in the figure1. The higher the bottle is raised, the higher the flow rate of the fluid will be. (i) If it is observed that the fluid and the blood pressures balance each other when the bottle is 1.2 m above the arm level, determine the gage pressure of the blood. (ii) If the gage pressure of the fluid at the arm level needs to be 20 kPa for sufficient flow rate, determine how high the bottle must be placed. Take the density of the fluid to be 1020 kg/m^3.	CO 1	PO 1 PO 2	**10**

			 Figure 1: Schematic for problem 1b.			
			UNIT - II			
3	a)		i) Briefly describe about velocity potential function and stream function and its relations in terms of equation. ii) The stream function for a dimensional flow is given by $\Psi = 2xy$. Calculate the resultant velocity at P (3,4). Also, the velocity potential function ϕ.	CO 1	PO 1 PO 2	**10**
	b)		Define i) Stream line, streak line and path line with a neat sketch ii) Lagrangian and Eulerian descriptions of fluid flow	CO 1	PO 1	**10**
			UNIT - III			
4	a)		Differentiate between Venturi meter and Orifice meter with neat sketches.	CO 4	PO 1	**6**
	b)		Describe static, dynamic and stagnation pressures.	CO 4	PO 1	**6**
	c)		A piezometer and a Pitot tube are tapped into a horizontal water pipe, as shown in figure 2, to measure static and stagnation (static 1 dynamic) pressures. For the indicated water column heights, determine the velocity at the center of the pipe.  Figure 2: Schematic for problem 4c.	CO 4	PO 1 PO 2 PO 4	**8**
			UNIT – IV			
5	a)		Write a short note on development of flow in pipes.	CO 1	PO 1	**6**

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		b)	Derive an expression for Darcy-Weisbach equation and Chezy's formula.	CO 2	PO 1 PO 2	**14**
			UNIT - V			
	6	a)	Find the displacement thickness, the momentum thickness and energy thickness $\frac{u}{U} = \left(\frac{y}{\delta}\right)^2$ for the velocity distribution in the boundary layer given by u Where u is the velocity at a distance y from the plate $u=U$ at $y=\delta$ and is boundary layer thickness.	CO 1	PO 1 PO 2	**10**
		b)	Explain the propagation of sound waves in different Mach regions.	CO 1	PO 1	**10**
			OR			
	7	a)	Write down in detail description of the six steps that comprise the method of repeating variables	CO 3	PO 1	**10**
		b)	Define and write the expressions for displacement, momentum and energy boundary layer thicknesses.	CO 1	PO 1	**10**

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