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: 23AS3PCFMS **Max Marks: 100**
Course: FLUID MECHANICS
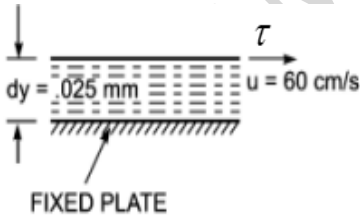
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

			UNIT - I	CO	PO	Marks
1	a)		i) Define pressure and what are the different types of pressures? ii) Define compressibility and derive the expression for isothermal compressibility.	CO 1	PO 1	**8**
	b)		A plate 0.025 mm distant from a fixed plate, moves at 60 cm/s and requires a shear stress of 2 N/m^2 to maintain this speed (Figure 1). Determine the fluid viscosity between the plates. Figure 1: Schematic for Problem 1b.	CO 1	PO 1 PO 2	**5**
	c)		Determine the intensity of shear of an oil having viscosity = 0.1 Ns/m^2. The oil used is for lubricating the clearance between a shaft of diameter 10 cm and its journal bearing. The clearance is 1.5 mm and the shaft rotates at 150 rpm.	CO 1	PO 1 PO 2	**7**
			OR			

2	a)		Define the following
			     i) Metacentric height
			     ii) Buoyancy
			     iii) Centre of pressure
			     iv) Vapour pressure and cavitation
			     v) Newtonian and non-Newtonian fluid
				CO 1	PO 1	**10**

	b)		The surface tension of water in contact with air at 20ºC is 0.0725 N/m. The pressure inside a droplet of water is to be 0.02 N/cm^2 greater than the outside pressure. Calculate the diameter of the droplet of water.	CO 1	PO 1 PO 2	**5**
	c)		A manometer is used to measure the pressure of a gas in a tank. The fluid used has a specific gravity of 0.85, and the manometer	CO 1	PO 1 PO 2	**5**

column height is 55 cm, as shown in Figure2. If the local atmospheric pressure is 96 kPa, determine the absolute pressure within the tank.
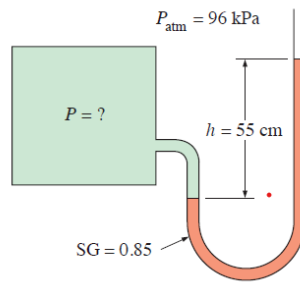

Figure 2: Schematic for Problem 2c.

		UNIT - II			
3	a)	Derive continuity equation for a 3-dimensional flow and deduce an expression considering unsteady and incompressible flow.	CO 1	PO 1 PO 2	**10**
	b)	The velocity vector in a fluid flow is given $\vec{V} = 4x^3\hat{i} - 10x^2 y j + 2t k$. Find the velocity and acceleration of a fluid particle at (2, 1, 3) at time t = 1.	CO 1	PO 1 PO 2	**10**
		UNIT - III			
4	a)	An oil of specific gravity 0.8 is flowing through a venturi meter having inlet diameter 20 cm and throat diameter of 10 cm. The oil-mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venturi meter. Take co-efficient of discharge as 0.98.	CO 4	PO 1 PO 2 PO 4	**10**
	b)	State Bernoulli's theorem for steady flow of an incompressible fluid and derive an expression for Bernoulli's equation. Write down all the assumptions involved in its derivation.	CO 2	PO 1 PO 2	**10**
		UNIT – IV			
5	a)	Deduce an expression for the Hagen-Poiseuille equation considering viscous fluid flow through a circular pipe.	CO 2	PO 1 PO 2	**16**
	b)	Define Reynold's number. What is the significance of it?	CO 2	PO 1 PO 2	**4**
		OR			
6	a)	Define and write the expressions for displacement, momentum and energy boundary layer thicknesses.	CO 2	PO 1 PO 2	**6**
	b)	Derive an expression for Darcy-Weisbach equation and Chezy's formula.	CO 2	PO 1 PO 2	**14**
		UNIT - V			

7	a)	Write short note on
		  i) Geometric similarity
		  ii) Kinematic similarity
		  iii) Dynamic similarity
			CO 3	PO 1	**8**

	b)	Write down in detail description of the six steps that comprise the method of repeating variables.	CO 3	PO 1 PO 2	**12**

******