U.S.N.										

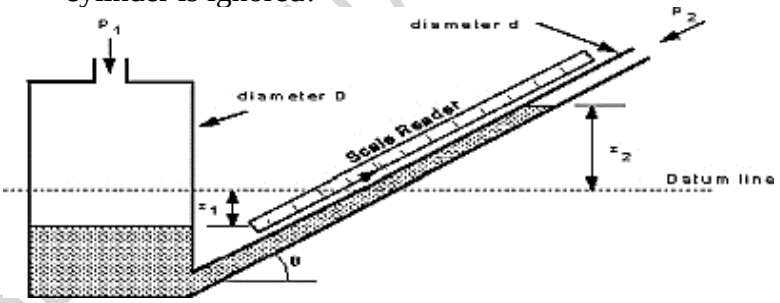
B.M.S. College of Engineering, Bengaluru-560019

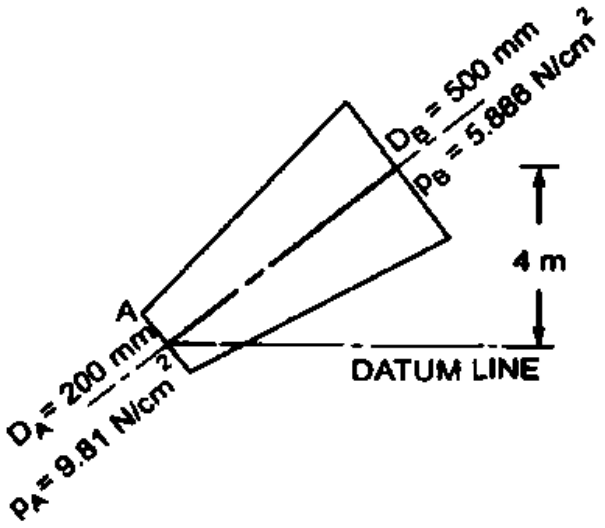
Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: CHEMICAL ENGINEERING **Duration: 3 hrs.**
Course Code: 19CH3DCFME **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)	An inclined tube manometer consists of a vertical cylinder 35mm 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 50mm along the inclined tube. ii. What is the error if the movement of the fluid in the vertical cylinder is ignored? 	CO1	PO1	06
	b)	Explain Newtonian and non-Newtonian fluids with a graph of shear stress and velocity gradient.	CO1	PO1	10
	c)	If the equation of a velocity profile over a plate is $u = 5y^2 + y$ (Where u is the velocity in m/s., determine the shear stress at y=0 and at y = 7.5 cm. Given the viscosity of the liquid is 8.35 poise.	CO1	PO1	04
		OR			
2	a)	If the atmospheric pressure at sea level is 101430 N/m^2. Determine the pressure at a height of 2500 m assuming that the pressure variation follows. (i) Hydrostatic law, (ii) Isothermal law. The density of air is given as 1.208 kg/m^3.	CO2	PO3	05
	b)	What are the properties of the fluids? Explain briefly.	CO2	PO3	04
	c)	Define and explain Reynolds stress and Eddy viscosity.	CO2	PO3	10

			UNIT - II			
	3	a)	Explain the three different correction factors for modified Bernoulli's equation.	***CO3***	***PO3***	**06**
		b)	0.7×10^{-3} m^3/s of acid slurry is to be pumped through a 50 mm diameter pipe, 30 m long to a tank which is 12 m higher than its reservoir. The frictional losses amounts to 3 m and efficiency of the pump is 50%. Calculate i. Power required to pump the acid and ii. Pressure developed by the pump. Data : Density of the acid slurry ρ_{Acid}= 1840 kg/m^3 and Viscosity of Acid μ_{Acid}=0.025 Ns/m^2	***CO3***	***PO3***	**10**
		c)	Explain with neat diagram, friction factor chart.	***CO3***	***PO3***	**04**
			OR			
	4	a)	Derive the equation of continuity and motion for incompressible fluids.	***CO3***	***PO3***	**10**
		b)	A pipeline carrying oil of specific gravity 0.87 changes in diameter from 200 mm at a point A to 500 mm diameter at point B, which is 4 m higher than A. If the pressure at A & B are 9.81 N/cm^2 and 5.886 N/cm^2, respectively and the discharge is 200 liter/s. Determine the loss of head & the direction of flow.  	***CO3***	***PO3***	**10**
			UNIT-III			
	5	a)	Explain the three different basic equations that are used for compressible fluid flow	***CO4***	***PO2***	**10**
		b)	Derive the expression for Bernoulli's equation (energy equation) for Isothermal and adiabatic process of compressible fluid flows	***CO4***	***PO2***	**10**
			UNIT - IV			
	6	a)	Derive the expression for work done by the centrifugal pump using inlet and outlet velocity triangle diagram	***CO4***	***PO2***	**10**
		b)	A pump is installed having the following parameters as: (i) impeller diameter: 410 mm (ii) speed: 750 r.p.m (iii) head: 12 m (iv) vane angle: 420 (v) width: 50 mm and (vi) manometric	***CO4***	***PO2***	**10**

			efficiency: 80%. Find out flow velocity at outlet, water velocity leaving the vane, angle of absolute velocity at outlet and discharge.			
			UNIT - V			
	7	a)	Using dimensional analysis, show that the torque due to friction developed over a disc rotating in a fluid is expressed as $T = D^5N^2\rho\ \Phi[\frac{\mu}{D^2N\ \rho}]$ Where, D is diameter of disc, N is speed, μ is the viscosity and ρ is the density of fluid	***CO3***	***PO3***	**10**
		b)	What are dimensionless parameters? Explain in brief	***CO3***	***PO3***	**10**

****