CBCS SCHEME

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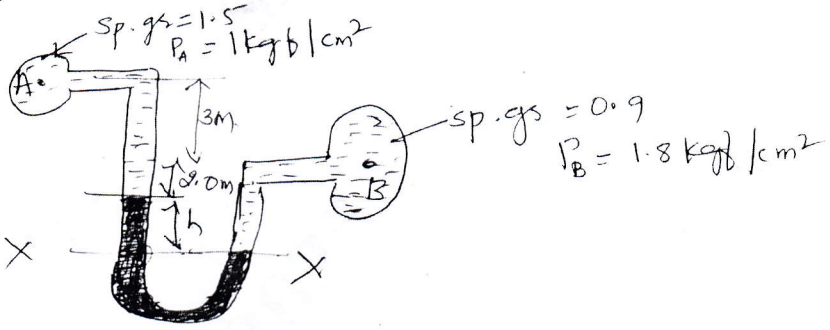
BAU403

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Fluid Mechanics and Fluid Machines

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define the following terms: i) Absolute viscosity ii) Kinematic viscosity iii) Surface tension iv) Bulk modulus v) Capillarity.	10	L1	CO1
	b.	State and prove the Pascal's law.	10	L2	CO1
		OR			
Q.2	a.	Derive an expression for centre of pressure of inclined plane surface submerged in liquid.	10	L2	CO1
	b.	A differential manometer is connected at the two points A and B two pipes as shown in Fig.Q.2(b). The pipe A contains a liquid of sp. gr. = 1.5 while pipe B contains a liquid of sp. gr. = 0.9. The pressure at A and B are 1 kg f/cm^2 and 1.80 kg f/cm^2 respectively. Find the difference in mercury length in the differential nanometer.  Fig.Q.2(b)	10	L3	CO2
		Module – 2			
Q.3	a.	Define the terms: i) Meta centre ii) Centre of Buogancy iii) Meta centric height iv) Gauge pressure and absolute pressure.	10	L1	CO1
	b.	Derive an expression for the time period of oscillations of a floating body in terms of radius of gyration and meta centric height of the floating body.	10	L1	CO2

		OR			
Q.4	**a.**	Derive continuity equation for three dimensional third flow in Cartesian – co – ordinates.	**10**	**L1**	**CO2**
	b.	A 0.3 m diameter pipe, conveying water, branches in to two pipes of diameters 0.2 m and 0.15 m respectively. If the average velocity in the 0.3 m diameter pipe is 2.5 m/s. Find the discharge in the pipe. Also determine the velocity 0.15 m pipe, if the average velocity in 0.2 m diameter pipe is 2 m/s.	**10**	**L1**	**CO2**
		Module – 3			
Q.5	**a.**	State Bernoulli's theorem for steady flow of an incompressible fluid. Also derive an expression for Bernoulli's theorem from first principle and state the assumptions made for such a derivation.	**10**	**L2**	**CO1**
	b.	The water is flowing through a pipe having 0.2 m and 0.1 m at section 1 and 2 respectively. The rate of flow through pipe is 0.035 m^3/s. The section 1 is 6 m above the datum and section 2 is 4 m above the datum. If the pressure at section 1 is 39.24×10^4 N/m^2. Find the intensity of pressure at section 2.	**10**	**L2**	**CO2**
		OR			
Q.6	**a.**	Define an orifice-meter. Prove that the discharge through an orifice-meter is given by the relation $Q = C_d \frac{a_1 a_2}{\sqrt{a_1^2 - a_2^2}} \times \sqrt{2gh}$.	**10**	**L1**	**CO1**
	b.	An orifice meter with orifice meter 0.15 m is inserted in a pipe of 0.3 m diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 0.5 m of Hg. Find the rate of flow of oil of sp. gr. 0.9 when the coefficient of discharge of the meter is 0.64.	**10**	**L1**	**CO2**
		Module – 4			
Q.7	**a.**	Derive Darcy equation also Chazy's equation for a fluid flow.	**10**	**L2**	**CO3**
	b.	Determine the rate of flow of water through a pipe of diameter 0.2 m and length 50 m when one end of the pipe is open to the atmosphere. The pipe is horizontal and the height of the water in the tank is 4 m above the centre of the pipe. Consider all minor losses and take f = 0.009 in the formula $h_f = \frac{4fLv^2}{2g \times d}$.	**10**	**L2**	**CO3**
		OR			
Q.8	**a.**	Define the following: i) Reynolds number ii) Critical Reynolds number iii) Laminar flow iv) Turbulent flow v) Viscous flow.	**10**	**L2**	**CO1**

	b.	A shaft having a diameter of 50 mm rotates centrally in a journal having a diameter of 50.15 mm and length of 100 mm. The angular space between the shaft and the bearing is filled with oil having viscosity of 0.9 poise. Determine the power absorbed in the bearing when the speed of rotation is 60 rpm.	10	L3	CO3
		Module – 5			
Q.9	a.	Define the following: i) Reynolds model law ii) Weber's model law iii) Mech's model law iv) Fundamental units and derived units.	10	L2	CO4
	b.	What are the methods of dimensional analysis also describe the Rayleighs method for dimensional analysis?	10	L3	CO4
		OR			
Q.10	a.	With a neat sketch, explain the terminology of a centrifugal pump.	10	L1	CO4
	b.	Explain with a neat sketch the construction and working principle of single stage reciprocating compressor.	10	L2	CO4

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