U.S.N.										

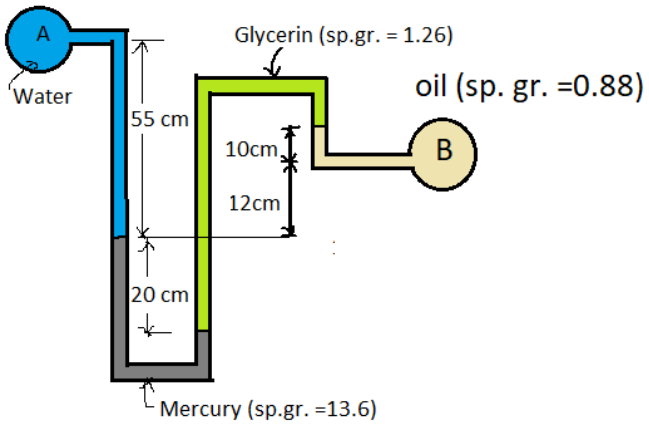
B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 19CV3PCMOF **Max Marks: 100**
Course: Mechanics of Fluids

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)	Define the following terms : (i) Ideal Fluids (ii) Surface tension (iii) Specific Gravity (iv) Capillarity (v) Fluid Continuum	CO 1	PO1	5
	b)	State Newton's law of Viscosity. Derive an expression for the same.	CO 1	PO1	5
	c)	Two large plane surfaces are 150 mm apart. The space between the surfaces is filled with oil of viscosity 0.972 Ns/m^2. A flat thin plate of 0.5 m^2 area moves through the oil at a velocity of 0.3 m/sec. Calculate the drag force when the plate is in the middle of the two plane surfaces.	CO 1	PO1	10
		OR			
2	a)	Explain (i) Atmospheric Pressure (ii) Gage Pressure (iii) Absolute Pressure (iv) Pressure Head (v) Inverted U-tube manometer	CO 1	PO1	5
	b)	A pressure gauge connected to a chamber reads 36 kPa (Vacuum) at a location where the local atmospheric pressure is 70 cm of Mercury. Determine the absolute pressure in the chamber.	CO 1	PO1	5
	c)	The pressure difference between an oil pipe and a water pipe is measured by a double-fluid manometer, as shown in Figure 1. For the given manometer readings and specific gravities, calculate the pressure difference between the pipes A and B.  Figure 1	CO 1	PO1	10

			UNIT – II			
	3	a)	Explain total pressure and center of pressure using diagram. Justify the statement that center of pressure is below centroid for vertical or inclined submerged plane surface.	*CO* 2	*PO1*	**10**
		b)	A tank completely full of water is 5 x 5 m^2 at the top, 3 x 3 m^2 at the bottom, and 2 meters deep. The four sides are planes each having the same trapezoidal shape. Find (i) the magnitude of the resultant pressure force on each side of the tank (ii) the location of the above pressure force.	*CO* 2	*PO1*	**10**
			UNIT - III			
	4	a)	Justify preferred use of Eulerian approach than Lagrangian approach in fluid mechanics. Explain continuity equation for steady compressible 1-D flow in varied cross-sectional area of flow passage with the help of diagram.	*CO* 3	*PO1*	**6**
		b)	The velocity potential for a 2-dimensional flow field is $\emptyset = \boldsymbol{2xy - x}$ Determine the velocity and the value of stream function at the point O (5, 4).	*CO* 3	*PO1*	**7**
		c)	A two dimensional velocity field is given by $u = 2y^2, v = 3x$ At $(x, y) = (1,2)$, find the (i) velocity (ii) local acceleration and (iii) convective acceleration.	*CO* 3	*PO1*	**7**
			OR			
	5	a)	Briefly describe following terms: (i) steady flow and unsteady flows (ii) uniform and non-uniform flows.	*CO* 3	*PO1*	**6**
		b)	Two velocity components are $u = x^3 + y^2 + 2z^2$ and $v = -x^2y - yz - xy$. Find the third component such that they satisfy the continuity equation.	*CO* 3	*PO1*	**7**
		c)	The two dimensional stream function for a flow field is $\psi = 5x - 7y + 4xy + 3$. Show that it represents possible case of irrotational flow. Determine the velocity potential of the flow field.	*CO 3*	*PO1*	**7**
			UNIT - IV			
	6	a)	State Bernoulli's equation of motion and its limitations with a neat sketch.	*CO* 4	*PO1*	**10**
		b)	A venturimeter measures flow of water in a 100 mm diameter horizontal pipe. The difference of head between the inlet and the throat of the venturimeter is measured by a U-tube manometer containing mercury, the space above the mercury in each side being filled with water. Estimate the diameter of the throat required in order that the difference of mercury level in the manometer shall be 0.25 m when the quantity of water flowing in the pipe is 800 litres per minute. Assume the discharge coefficient as 0.97.	*CO* 4	*PO1*	**10**

			UNIT - V			
	7	a)	What are the advantages of using triangular notch over rectangular notch?	*CO* 4	*PO1*	**5**
		b)	A pipeline 0.300 m in diameter and 1800 m long has a slope of 1 in 200 for the first 900 m and 1 in 100 for the next 900 m. The pressure at the upper end of the pipeline is 120 kPa and at the lower end is 60 kPa. Taking f = 0.035, determine the discharge through the pipe.	*CO* 4	*PO1*	**7**
		c)	What is the maximum velocity of approach that can be neglected if the discharge is to be measured within 5% accuracy by using triangular notch to measure flow in a channel under a head of 0.5 m.	*CO* 4	*PO1*	**8**

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