CBCS SCHEME

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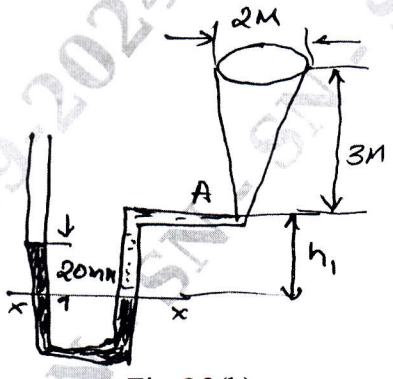
BAU403

Fourth Semester B.E./B.Tech Degree Examination, June/July 2024
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.
3. Missing data, if any, may be suitably assumed.

		Module – 1	M	L	C
Q.1	a.	Define the following and write down the units. i) Density ii) Specific gravity iii) Viscosity iv) Surface tension v) Capillarity.	10	L1	CO1
	b.	The dynamic viscosity of an oil used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4m and rotates at 190r.p.m. Calculate the power cost in the bearing for a sleeve length of 90mm. The thickness of the oil film is 1.5mm.	10	L1	CO1
		OR			
Q.2	a.	Prove : i) Pascals law of pressure ii) Hydrostatic law.	10	L2	CO1
	b.	Fig.Q2(b) shows a conical vessel having its outlet at A to which a U – tube monometer is connected. The reading of the manometer given in figure shows when the vessel is empty. Find the reading of the manometer when the vessel is completely filled with water.  Fig.Q2(b)	10	L3	CO1
		Module – 2			
Q.3	a.	Write short notes on : i) Stability of submerged body ii) Stability of a floating body.	10	L1	CO2
	b.	A block of wood of specific gravity 0.7 floats in water. Determine the meta-centric height of the block of its size 2m × 1m × 0.8m.	10	L3	CO2

		OR			
Q.4	**a.**	A 30cm diameter pipe, conveying water, branches into two pipes of diameters 20cm and 15cm respectively. If the average velocity is 30cm diameter pipe 2.5m/s find the discharge in this pipe. Also determine the velocity in 15cm pipe if the average velocity in 20cm diameter is 2m/s.	**10**	**L3**	**CO2**
	b.	Explain : i) Velocity potential function ii) Stream function iii) Equipotential line iv) Line of constant stream function	**10**	**L4**	**CO3**
		Module – 3			
Q.5	**a.**	Derive Bernoull's equation from first principles state the assumptions made.	**10**	**L2**	**CO2**
	b.	A pipe line carrying oil of specific gravity 0.87, charge in diameter from 200mm diameter at a position A to 500mm diameter at a position B which is 4 meters at a higher level. If the pressure at A and B are 9.81N/cm^2 and 5.886N/cm^2 respectively and the discharge is 200 liter/s. Determine the loss of head and direction of flow.	**10**	**L3**	**CO2**
		OR			
Q.6	**a.**	Determine the expression for rate of flow through a venturimeter.	**10**	**L1**	**CO2**
	b.	Determine the height of a rectangular weir of length 6m to be built across a rectangular channel. The maximum depth of water on the upstream side of weir is 1.8m and discharge is 2000LPS. Take C_d = 0.6 and neglect the end constrictions.	**10**	**L4**	**CO2**
		Module – 4			
Q.7	**a.**	What are minor and major energy losses for flow through pipes? Explain.	**10**	**L1**	**CO3**
	b.	Determine the difference in elevations between the water surfaces on the two tanks which are connected by a horizontal pipe of diameter 300mm and length 400m. The rate of flow of water through the pipe is 300 liters/s. Consider all losses and take the value of t = 0.008.	**10**	**L4**	**CO3**
		OR			
Q.8	**a.**	Derive Hagen Poiseuille's equation for laminar flow through circular pipe.	**10**	**L1**	**CO3**
	b.	There is a horizontal crank 40mm wide and 2.5mm deep in a wall of thickness 100mm water leaks through the crack find the discharge of water through the crack if the difference of pressure between two ends of the crack is 0.02943N/cm^2. Take the viscosity of water equal to 0.01 poise.	**10**	**L3**	**CO3**

Module – 5					
Q.9	**a.**	What is similitude? What are various types of similarities exist between a model and a proto type.	**10**	**L2**	**CO4**
	b.	A pipe diameter 1.5m required to transport and oil of specific gravity 0.9 and viscosity 3×10^{-2} poise at the rate of 3000 liters/s tests were conducted on a 15cm diameter pie using water at 20°C. Find the velocity and rate of flow in the model viscosity of water at 20°C is 0.01 poise.	**10**	**L3**	**CO4**
OR					
Q.10	**a.**	Explain with a sketch working of a centrifugal pump.	**10**	**L2**	**CO2**
	b.	Sketch and explain the working of a single stage reciprocating compressor.	**10**	**L2**	**CO2**

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