P P SAVANI UNIVERSITY

Fourth Semester of B. Tech. Examination

November 2022

SECH2050 FLUID FLOW OPERATION

24.11.2022, Thursday **Time: 01:00 p.m. To 3:30 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises two sections.
2. Section I and II must be attempted in same answer sheet.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculators is allowed.

SECTION – I

			CO	BTL
Q - 1	Answer Any five of the Following: (MCQ/Short Question/Fill in the Blanks)	**[05]**		
(i)	An ideal fluid is an incompressible and _____ fluid.		1	1
(ii)	For a Newtonian fluid shear stress is directly proportional to _____.		1	1
(iii)	Kinematic viscosity of a liquid is dynamic viscosity divided by its ____		1	1
(iv)	Water is not a _____ liquid.		1	1
(v)	The unit for Poise is _____		1	1
(vi)	The compressible fluid used in an inverted manometer is _____.		1	1
Q - 2 (a)	Classify types of Fluid and explain with suitable examples.	**[05]**	1	1
Q - 2 (b)	Explain different types of manometer in Details	**[05]**	2	3
	OR			
Q - 2 (a)	Estimate the pressure in N/m^2 due to a column of a) 10 cm of water b) 10 cm of Hg (specific gravity of mercury is 13.6)	**[05]**	2	4
Q - 2 (b)	Explain frictional losses for laminar and turbulent fluid flow.	**[05]**	2	4
Q - 3 (a)	Differentiate Variable Area Meter and variable head meter in detail	**[05]**	2	3
Q - 3 (b)	Explain and derive the equation of continuity.	**[05]**	1	3
	OR		1	3
Q - 3 (a)	Explain Steady and Unsteady Flow Also Explain Reynolds number with the terms.	**[05]**	1	3
Q - 3 (b)	Estimate the critical velocity when water is flowing through a pipe of 10cm diameter? Given Data Re = 2500, Density = 103 Kg/ m^3, Viscosity = 10^{-3} Ns/m^3	**[05]**	1	3
Q - 4	Attempt any one	**[05]**		
(i)	Define mass velocity and fully developed flow		3	3
(ii)	Define Newton's law of viscosity.		2	2

SECTION – II

Q - 1	Answer the Any five of Following: (MCQ/Short Question/Fill in the Blanks)	**[05]**		
(i)	Explain 'Cavitation' in pumps..		4	2
(ii)	Define 'Minimum fluidization velocity'.		5	2
(iii)	Define 'Equivalent diameter' for fluid flow through channels of non-circular cross section		5	2
(iv)	Define the term 'Slip velocity'.		5	2
(v)	Give two important industrial applications of fluidized bed.		5	2
(vi)	Write the principle of Rotameter		5	2
Q - 2 (a)	Derive equation for theoretical discharge of orifice Meter	**[05]**	5	2
Q - 2 (b)	Water is flowing at a rate of 500 cm^3/s through an orifice of 25 mm diameter installed in a 75 mm diameter pipe. What will be the difference in the level on a mercury manometer connected across the meter ? The coefficient of orifice meter is 0.65.	**[05]**	4	3

	OR			
Q - 2 (a)	A venturimeter is installed in a pipe line for the measurement of flow rate of water. The pressure drop across the throat and upstream of the meter is ten centimeters of mercury. Calculate the volumetric flow rate of water in m^3/s	**[05]**	4	3
Q - 2 (b)	Acetic acid flows through a 75 mm internal diameter pipe at a rate of 0.015 m^3/s. Calculate the pressure drop in the horizontal pipe of length 70 m. Data : Viscosity of acid = 2.5 (mN.s)/m^2 Density of acid = 1060 kg/m^3	**[05]**	5	3
Q - 3 (a)	State the advantages of a centrifugal pump	**[05]**	3	3
Q - 3 (b)	Classify the reciprocating pump and explain any one type in details.	**[05]**	3	3
	OR			
Q - 3 (a)	Water is to be pumped from ground level tank, which is open to atmosphere to a cooling tower. The difference between the level of water in the tank and discharge point is 15 m. The velocity of water through 40 mm internal diameter discharge pipe is 3 m/s. In the pipe line there is a valve which is equivalent to 200 pipe diameters and fitting equivalent to 150 pipe diameters. The length of the entire is 30 meters. Calculate the power requirement of the pump if efficiency of pump is 60%. Data : density of water = 1000 kg/m^3 Viscosity of water = 0.0008 PaS. Friction factor 'f' = 0.004.	**[10]**	3	4
Q - 4	Attempt any one	**[05]**		
(i)	Give two applications in chemical industries where centrifugal pump cannot be used.		5	1
(ii)	What are the advantages of Centrifugal pump over Reciprocating pump?		3	3

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CO : Course Outcome Number BTL : Blooms Taxonomy Level

Level of Bloom's Revised Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create