PRN:		Course Code:	UCE304

Second Year B. Tech End Semester Examination Winter 2024

Fluid Mechanics

000129

Day and Date: Fri 29 Nov 2024

Time: 10:30AM To 01.30PM

Max Marks: **100**

Duration: **03** hrs

Instructions: 1) All questions are compulsory.

2) Assume suitable data if required and mention it clearly.

3) Use of non-programmable calculator is allowed.

			Marks	Bloom's Level	CO
Q.1		**Attempt the following**			
	a)	Explain Newton's law of viscosity. Differentiate Newtonian and non-Newtonian fluids. Give examples of each.	08	2	CO1
	b)	Discuss practical applications of Pascals 'law, hydrostatic law.	08	3	CO1
		OR			
	b)	A tank carries fluid upto 1.5 m depth of specific gravity 1.5. On top of it, there is another fluid of specific gravity 1.8 upto height of 3 m. Calculate pressure acting at the bottom of the tank. Draw pressure distribution diagram and calculate the resultant force.	08	3	CO1
Q.2		**Attempt the following**			
	a)	Explain following terms in detail: 1) Stream lines 2) streak lines 3) Path lines 4) Stream tube	08	3	CO1
	b)	State and explain continuity equation for 2-D flow. The diameters of pipe at sections 1 and 2 are 25 cm and 30 cm respectively. Find the discharge through the pipe if velocity of water at section 1 is 4 m/s. Determine velocity at section 2.	08	3	CO2
		OR			
	b)	Derive Euler's equation of motion.	08	3	CO2
Q.3		**Attempt any two from the following**			
	a)	Discuss assumptions in Hazen-Poiseuille's equation for laminar flow.	08	3	CO2
	b)	The following data relates to an orifice meter: a) Diameter of pipe = 300 mm	08	3	CO3

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b) Diameter of orifice = 150 mm

c) Specific gravity of oil = 0.9

d) Reading of differential manometer = 500 mm of mercury

e) Coefficient of discharge = 0.64

Determine the rate of flow of oil.

c)	Explain Pitot tube as an application of Bernoulli's equation.	08	3	CO3
Q.4	**Attempt any two from the following**			
a)	Derive Darcy-Wiesbach equation for flow through circular pipe.	08	3	CO3
b)	Discuss concept of equivalent pipe. A piping system consists of pipes arranged in series. The lengths of pipe are 1200 m, 750 m and 600 m. The diameter of pipes are 750 mm, 600 mm and 450 mm respectively. Convert the system to an equivalent pipe of 450 mm pipe.	08	3	CO4
c)	Explain in detail the working of Siphon. Explain all parts of siphon.	08	3	CO4
Q.5	**Attempt any Two of the following**			
a)	Derive equation of GVF.	09	3	CO4
b)	Explain S_1, H_1 and M_2 profile in detail.	09	3	CO4
c)	In a rectangular channel, a discharge of 2 $m^3/s/m$ flows with a Froude number 6. If hydraulic jump takes place, calculate the energy lost per meter width of channel due to jump.	09	3	CO4
Q.6	**Attempt any Two of the following**			
a)	A rectangular notch 40 cm long is used for measuring a discharge of 30 litres per second. An error of 1.5 mm was made, while measuring the head over the notch. Calculate the percentage error in the discharge. Take C_d = 0.6.	09	2	CO4
b)	Write the note on the following: i. Unit quantities ii. Specific speed iii. Draft tube	09	2	CO4
c)	A jet of water, 10 cm diameter moves with a velocity of 25 m/s and strikes series of flat plates fixed on the periphery of wheel. If due to impact the wheel rotates at 100 rpm, calculate (1) Force exerted by jet on the plate (2) Work done on the plate/sec. (3) Torque exerted on wheel if the radial distance at which jet strikes the plate and axis of wheel is 1 m.	09	2	CO4

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