

Code: 23CE3303

**II B.Tech - I Semester – Regular Examinations - DECEMBER 2024**

**FLUID MECHANICS  
(CIVIL ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

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- Note: 1. This question paper contains two Parts A and B.  
 2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.  
 3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.  
 4. All parts of Question paper must be answered in one place.

BL – Blooms Level

CO – Course Outcome

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**PART – A**

		BL	CO
1.a)	Define capillarity.	L1	CO1
1.b)	State the Newton's law of viscosity.	L1	CO1
1.c)	Classify the pressures and relate them.	L2	CO2
1.d)	State the principle of diaphragm pressure gauge and its use.	L2	CO2
1.e)	what is an ideal fluid.	L1	CO3
1.f)	Differentiate steady and unsteady flows.	L2	CO3
1.g)	Mention different forces acting on a body.	L1	CO4
1.h)	What is venture meter?	L1	CO4
1.i)	What is Total energy line?	L2	CO5
1.j)	What is hydraulic gradient line?	L2	CO5

**PART – B**

			BL	CO	Max. Marks
<b>UNIT-I</b>					
2	a)	How the viscosity of fluids changes with temperature? Explain.	L2	CO1	5 M

	b)	Find the force and power required to lift the plate with a constant velocity of 10cm/s for a plate 1.5m X 1.5m and 2mm thick weighing 50N is to be lifted through a gap of 2cm filled with an oil whose $\mu = 25$ poise and specific gravity = 0.9.	L3	CO1	5 M
<b>OR</b>					
3	a)	Define density, specific weight, and specific gravity, and explain their interrelationships.	L2	CO1	5 M
	b)	Find the mass density of the liquid if the difference in two menisci is 2mm for a U-tube is made up of two capillaries of bores 1.5mm and 2mm respectively. The tube is held vertical and partially filled with liquid whose $\sigma = 0.075$ N/m. Assume the angle of contact is zero.	L3	CO1	5 M
<b>UNIT-II</b>					
4	a)	What is U-tube manometer? Derive an expression for pressure measurement.	L3	CO2	5 M
	b)	Determine the total pressure on a circular plate of diameter 1.5m which is placed vertically in water in such a way that the center of the plate is 3m below the free surface of water. Find the position of center of pressure also.	L3	CO2	5 M
<b>OR</b>					
5	a)	Compare U-tube differential manometer and inverted U-tube differential manometer and their uses.	L2	CO2	5 M
	b)	Find the differential reading of manometer of an inverted U-tube manometer using oil of 0.8 specific gravity as manometric fluid is connected to the pipes A and B carrying the liquids of specific gravities of 1.2 and	L3	CO2	5 M

		1 respectively. The pipes A and B are at same level. The height of the liquid of oil of 1.2 specific gravity from the centre of the pipe is 40cm. Assume all liquids are immiscible and pressure in pipe B is 2000Pa above the pressure in pipe A.			
<b>UNIT-III</b>					
6	a)	Explain the equation of continuity and obtain an expression for continuity equation for three dimensional flow.	L3	CO3	5 M
	b)	Explain about following i) Stream line and Path line. ii) Uniform flow and Non-Uniform flow. iii) Compressible and incompressible flow.	L2	CO3	5 M
<b>OR</b>					
7	a)	Explain stream function and velocity potential function.	L2	CO3	5 M
	b)	Explain one, two, and three dimensional flow with neat sketches.	L2	CO3	5 M
<b>UNIT-IV</b>					
8	a)	Compare the relative merits and demerits of venturimeter with respect to orifice meter.	L2	CO4	5 M
	b)	A pitot tube is placed in the center of a 30cm pipe line has an orifice pointing upstream and other perpendicular to it. The mean velocity in the pipe is 0.8 of central velocity. Find the discharge through the pipe if the pressure difference between two pipes is 60mm of water. Take coefficient of pitot tube as 0.98.	L3	CO4	5 M
<b>OR</b>					
9	a)	Explain the principle of venturimeter with a neat sketch. Derive the expression for rate of flow of fluid through it.	L3	CO4	5 M

	b)	What is Euler's equation? How will you obtain Bernoulli's equation from it.	L3	CO4	5 M
<b>UNIT-V</b>					
10	a)	What are the minor losses in pipes? Give the appropriate formulae to calculate the losses.	L2	CO5	5 M
	b)	Determine the difference in elevation between the water surfaces in the two tanks which are connected by a horizontal pipe of diameter 30cm and length of 400m. The rate of flow of water through the pipe is 300lt/s. Neglect the minor losses and $f = 0.008$ .	L4	CO5	5 M
<b>OR</b>					
11	a)	Derive an expression for flow over a rectangle notch.	L3	CO5	5 M
	b)	Three pipes are of 30cm, 20cm, 40cm diameters have lengths of 300m, 170m 210m respectively. They are connected in series. The ends of the pipes are connected with two tanks whose difference in water levels is 12m. Determine the rate of flow of water if the coefficient of friction are 0.005, 0.0052, 0.0048 respectively.	L4	CO5	5 M