Reg. No.

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024
Third Semester
CE22309 – FLUID MECHANICS THEORY AND PRACTICES
(Civil Engineering)
(Regulation 2022)

TIME: 2 HOURS   **MAX. MARKS: 60**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Summarise the differences between the solid and fluid and apply the fluid properties and its behaviour in static conditions to solve problems.	3
CO 2	Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.	3
CO 3	Analyze the model for flow studies and to predict the performance of prototype.	3
CO 4	Analyze the losses in pipe lines for both laminar and turbulent conditions.	3
CO 5	Apply the boundary layer concepts to find the drag force exerted by fluid on the flat solid surface.	3

PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

		CO	RBT LEVEL
1.	Differentiate center of pressure and center of buoyancy.	1	2
2.	Calculate the specific weight and weight of one litre of petrol of specific gravity=0.7.	1	3
3.	A 0.1 m diameter pipe carrying water at 1 m/s velocity suddenly contracts to 0.05 m diameter pipe. Determine the discharge and velocity in 0.05 m diameter pipe.	2	3
4.	Distinguish steady and unsteady flow with example.	2	2
5.	State Buckingham's Π theorem.	3	2
6.	What is Weber Number?	3	2
7.	What is Moody's diagram and its importance in pipe flow?	4	2
8.	Draw the shear stress and velocity distribution diagram for a laminar flow in a circular pipe.	4	2
9.	Define Boundary layer thickness.	5	2
10.	Write Von Karman's momentum integral equation for boundary layer flow.	5	2

PART- B (3 x 10 = 30 Marks)

		Marks	**CO**	**RBT LEVEL**

11.(a) A sliding fit cylindrical body of diameter 399 mm, length 200 mm and mass 3.5 **(10)** **1** **3** kg drops vertically down inside a hollow cylinder of 400 mm internal diameter at a constant velocity of 0.05 m/s. Calculate viscosity of oil filled in the space between the cylinders.

(OR)

(b) Find the total pressure and position of centre of pressure on a triangular plate of **(10)** **1** **3** base 2 m and height 3 m which is immersed in water in such a way that the plane of the plate makes an angle of 60° with the free surface of the water. The base of the plate is parallel to water surface at a depth of 2.5 m from water surface.

12.(a) Using Buckingham π method of dimensional analysis obtain an expression for **(10)** **3** **3** the drag force R on a partially submerged body moving with a relative velocity V in a fluid, the other variables being the linear dimensions L, height of surface roughness K, fluid density ρ and the gravitational acceleration g.

(OR)

(b) A 7.2m high and 15m long spillway discharges 94m^3/s discharge under a head **(10)** **3** **3** of 2m. If a 1:9 scale model of a spillway is to be constructed, determine model dimension, head over spillway and the model discharge.

13.(a) An oil of viscosity 0.1 N s/m^2 and specific gravity 0.9 is flowing through a **(10)** **4** **3** circular pipe of diameter 50mm and of length 300m. The rate of flow of fluid through pipe is 3.5 litres/s. Find the pressure drop in a length of 300m and also shear stress at pipe wall and maximum velocity flowing in a pipe. Sketch the shear and velocity distribution.

(OR)

(b) A horizontal pipe line 40m long is connected to a water tank at one end and **(10)** **4** **3** discharges freely into the atmosphere at the other end. For first 25m of its length from the tank, the pipe is 150mm diameter and is suddenly enlarged to 300mm. The height of water level in the tank is 8 m above the centre of the pipe. Considering all losses of head which occur, determine rate of flow.

PART- C (1 x 10 = 10 Marks)
(Q.No.14 is compulsory)

	Marks	CO	RBT LEVEL
	(10)	2	3

14. Water flows through a pipe AB 1.2m diameter at 3 m/s and then passes through a pipe BC 1.5m diameter. At C, pipe branches. Branch CD is 0.8m in diameter and carries one third of the flow in AB. The flow velocity in branch CE is 2.5 m/s. Find rate of flow in AB and velocity in BC and CD.

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