Code No : **20CE3T02** **R20**

II B. TECH I SEMESTER REGULAR EXAMINATIONS, FEB - 2022
FLUID MECHANICS
(Civil Engineering)

Time : 3 Hours **Max. Marks : 70**

Note : Answer **ONE** question from each unit **(5 × 14 = 70 Marks)**

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UNIT-I

1. a) A fluid of specific gravity 10 is having a volume of 10 liters. Find its mass, weight and specific weight. [7M]

   b) The velocity distribution of fluid over a plate is given by $v = 2y^2$ where y is the distance in m from the plate and v is the velocity of fluid in m/s. Find the shear stress at distance of 50 cm from the plate if the viscosity of fluid is 8 centipoise. [7M]

(OR)

2. a) Derive the expression for excessive pressure developed in a soap bubble of diameter 'd' in terms of surface tension. [7M]

   b) A plate with surface area of 0.4 m^2 and weight of 500 N slides down on an inclined plane at 30^0 to the horizontal at a constant speed of 4 m/s. If the inclined plane is lubricated with an oil of dynamic viscosity2 poises, find the thickness of lubricated film. [7M]

UNIT-II

3. a) Derive Euler's equation of motion and obtain Bernoulli's equation by integrating it. State the assumptions made while deriving it. [7M]

   b) A tank contains two immiscible liquids water and mercury. Water of depth 2 m lies above mercury layer of thickness 0.5 m. If the top of the tank is opened to atmosphere, find the absolute and gauge pressure at the bottom of the tank. [7M]

(OR)

4. a) Derive the expression for magnitude and location of hydrostatic force acting on a submerged inclined plane. [7M]

   b) A pipe of 15 cm in diameter carries water at the rate of 80 liters per second. The pipe branches into two sections of 10 cm and 5 cm in diameter. If the velocity in 5 cm section is 10 m/s, find the velocity in 10 cm diameter pipe and flow rate in each branch pipe. [7M]

UNIT-III

5. a) Write a short note on impulse-momentum equation. [7M]

   b) A bend in pipeline carrying water gradually reduces from 0.6 m to 0.4 m and deflects the flow through an angle of 50^0. At the larger end the pressure is 180 kN/m^2. Determine the magnitude and direction of force exerted on the bend when the rate of flow in pipe is 0.9 m^3/s. [7M]
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(OR)

6. a) Derive Euler's equation of motion and state the assumptions made while deriving the equation. [7M]

   b) Water is flowing in a vertical pipe having diameter of 0.5 m at its inlet and 1m at outlet. If the outlet is 3 m above the inlet and velocity at inlet is 1.5 m/s. Find the difference in pressure between inlet and outlet neglecting losses. [7M]

UNIT-IV

7. a) Derive the equation of discharge through a triangular Notch. When triangular notches are preferred over rectangular notches? [7M]

   b) A masonry weir is constructed across a river of width 60 m and is divided into 5 spans separated by piers of thickness 1.2 m each. If the head of water above the crest of weir is 1.5m, find the discharge through weir considering end contraction. Assume $C_d = 0.7$. [7M]

(OR)

8. a) Derive the equation of discharge through a rectangular notch. [7M]

   b) A Venturimeter has its axis vertical, the inlet and throat diameters being 150 mm and 75 mm respectively. The throat is 225 mm above inlet and coefficient of discharge is equal to 0.96. Petrol of specific gravity 0.78 flows up through the meter at a rate of 0.03 m^3/s. Find the pressure difference between the inlet and the throat. [7M]

UNIT-V

9. a) Write short note on (i) pipes connected in series (ii) pipes connected in parallel (iii) variation of friction factor with Reynold's Number in laminar flow [7M]

   b) Two tanks A and B are connected by two pipes in series. The first 21 m pipe has a diameter 75 mm and the remaining 9 m pipe is of diameter 50 mm. The water level in tank A is 2.4 m above the water level in tank B. Darcy's friction factor for both the pipes is 0.02. Find the discharge from tank A to tank B. [7M]

(OR)

10. a) Derive Darcy-Weisbach equation. [7M]

    b) Two pipes of diameters of 5 cm and 10 cm and each 200 m in length are connected parallel between two tanks having a water level difference of 10 m. If these two pipes are to be replaced by a single pipe supplying the same quantity of water, find out the required diameter. Take friction factor f = 0.04 for all pipes and neglect minor losses. [7M]

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