

**20CE3304****UNIT-IV**

8. a. Derive an expression for the Darcy Weisbach's loss of head due to friction in pipes. **(CO4 K2) 7M**
- b. A liquid of viscosity of 0.9 poise is filled between two horizontal plates 10 mm apart. If the upper plate is moving at 1 m/s with respect to the lower plate which is stationary and the pressure difference between two sections 60 m apart is 60 kN/m<sup>2</sup>, determine:
- The velocity distribution,
  - The discharge per unit width and
  - The shear stress on the upper plate. **(CO4 K3) 8M**

(or)

9. a. A piping system consists of three pipes arranged in series; the lengths of the pipes are 1200 m, 750 m and 600 m and diameters 750 mm, 600 mm and 450 mm respectively.
- Transform the system to an equivalent 450 mm diameter pipe and
  - Determine an equivalent diameter for the pipe, 2550 m long. **(CO4 K3) 7M**
- b. Describe Reynolds experiment to demonstrate the types of flow. **(CO4 K2) 8M**

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**VR20**Reg. No: 

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**SIDDHARTHA ENGINEERING COLLEGE**

(AUTONOMOUS)

II/IV B.Tech. DEGREE EXAMINATION, DECEMBER - 2023

Third Semester

**CIVIL ENGINEERING**

20CE3304 FLUID MECHANICS

*Time: 3 hours**Max. Marks: 70**Part-A is compulsory**Answer One Question from each Unit of Part - B**Answer to any single question or its part shall be written at one place only***PART-A****10 x 1 = 10M**

- What is the difference between an ideal and a real fluid? **(CO1 K1)**
  - What is dynamic viscosity? What are its units? **(CO1 K1)**
  - Define Pascal's Law. **(CO1 K1)**
  - Define convective and local accelerations. **(CO2 K1)**
  - What are the limitations of the Bernoulli's equation? **(CO2 K2)**
  - Define Vena - Contracta. **(CO3 K1)**
  - What is the purpose of Pitot tube? **(CO3 K2)**
  - Classify losses in pipe flow. **(CO4 K1)**
  - What is Hagen Poiseuille's law? **(CO4 K1)**
  - What is Equivalent pipe? **(CO4 K1)**

**20CE3304****PART-B****4 x 15 = 60M****UNIT-I**

2. a. Calculate the specific weight, specific mass, specific volume and specific gravity of a liquid having a volume of  $6 \text{ m}^3$  and weight of  $44 \text{ kN}$ .  
(CO1 K3) 7M
- b. Derive expressions for total pressure and centre of pressure for a vertically immersed surface.  
(CO1 K2) 8M
- (or)
3. a. Derive the equation to determine pressure inside a Water droplet, Soap bubble and Liquid jet.  
(CO1 K2) 7M
- b. A trapezoidal 2 m wide at the bottom and 1 m deep has side slopes 1: 1. Determine:  
i) Total pressure;  
ii) Centre of pressure on the vertical gate closing the channel when it is full of water.  
(CO1 K3) 8M

**UNIT-II**

4. a. Explain in detail about different type of fluid flows. (CO2 K2) 7M
- b. Derive Euler's equation of motion. (CO2 K2) 8M
- (or)
5. a. A 45 cm diameter pipe discharging water into branches of two pipes of diameter 30 cm and 20 cm respectively. If the average velocity in the 45 cm diameter pipe is 3 m/sec, find the discharge in 45 cm pipe. Also determine the velocity in 20 cm pipe, if the average velocity in 30 cm diameter pipe is 2.5 m/sec. (CO2 K3) 7M

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5. b. In a  $45^\circ$  bend a rectangular air duct of  $1 \text{ m}^2$  cross-sectional area is gradually reduced to  $0.5 \text{ m}^2$  area. Find the magnitude and direction of force required to hold the duct in position if the velocity of flow at  $1 \text{ m}^2$  section is  $10 \text{ m/s}$ , and pressure is  $30 \text{ kN/m}^2$ . Take the specific weight of air as  $0.0116 \text{ kN/m}^3$ .  
(CO2 K3) 8M

**UNIT-III**

6. a. Derive the equation for discharge of a liquid through a orifice meter.  
(CO3 K2) 7M
- b. Obtain an expression for discharge through large rectangular orifice.  
(CO3 K2) 8M

(or)

7. a. Water at the rate of 30 litres/sec is flowing through a 0.2 m pipe. A venturimeter of throat diameter 0.1 m is fitted in the pipeline. A differential manometer in the pipe- line has an indicator liquid M and the manometer reading is 1.16 m. What is the relative density of the manometer liquid M? Take venturi co-efficient = 0.96 and density of water =  $998 \text{ kg/m}^3$ .  
(CO3 K3) 7M
- b. A U-tube manometer is used to measure the pressure of oil of specific gravity 0.8 flowing in a pipe line. The left end of U-tube manometer is connected to the pipe and right limb is open to atmosphere. The difference of mercury (specific gravity = 13.6) level in the two limb is 140 mm. The mercury level in the right limb is 80 mm above the centre of the pipe. Determine the gauge pressure and absolute pressure of the oil in the pipe.  
(CO3 K3) 8M