8. a. Explain briefly the major loss in the pipe flow. Derive an expression for loss for energy due to friction in a pipe flow. **(CO4 K2) 7M**

   b. Two pipes each 300 m long are available for connecting to a reservoir from which a flow of 0.085 m^3/s is required. If the diameters of the two pipes are 0.30 m and 0.15 m respectively, determine the ratio of the head lost when the pipes are connected in series to the head lost when they are connected in parallel. Neglect minor losses. **(CO4 K2) 8M**

(or)

9. a. Two parallel fixed plates are kept 100 mm apart and oil of viscosity 2.45 Pa-s flowing with mean velocity 1m/sec. Distance over which oil flows is 100m. Determine i) pressure gradient (Pa/meter length) ii) Shear stress at the boundary iii) Velocity of oil at 20mm from the plate. **(CO4 K2) 8M**

   b. Explain Reynolds experiment to classify the types of flow. **(CO4 K2) 7M**

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VR23

Reg. No:

VELAGAPUDI RAMAKRISHNA

SIDDHARTHA ENGINEERING COLLEGE

(AUTONOMOUS)

II/IV B.Tech. DEGREE EXAMINATION, DECEMBER - 2024

Third Semester

CIVIL ENGINEERING

23CE3305 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

5 x 2 = 10M

1. a. What is capillarity and explain the conditions of capillary rise and fall. **(CO1 K1)**

   b. Define newton's law of viscosity? Give some examples for Newtonian and non-Newtonian fluids. **(CO1 K1)**

   c. Define path line, streak line and stream line. **(CO2 K1)**

   d. Differentiate between Total Energy line and Hydraulic Gradient line. **(CO3 K2)**

   e. Differentiate between major and minor losses with examples in a pipe flow. **(CO4 K2)**

PART-B

4 x 15 = 60M

UNIT-I

2. a. Define the terms: Dynamic viscosity, Kinematic viscosity, mass density, specific volume, specific gravity, specific weight, bulk modulus and vapour pressure with dimensions. **(CO1 K2) 8M**

   b. A cylinder of 0.30 m diameter rotates concentrically inside a fixed cylinder of 0.31 m diameter. Both the cylinders are 0.3 m long. Determine the viscosity of the liquid which fills the space betweenthe cylinders if a torque of 0.98 N.m is required to maintain an angular velocity of 2π rad/s (or 60 r.p.m., since angular velocity $\omega = (2\pi N/60)$ where N is speed of rotation in r.p.m.). **(CO1 K3) 7M**

(or)

3. a. Define and derive the Pascal's law. **(CO1 K3) 7M**

   b. A rectangular tank of size (6m X 3m) is divided into two compartments by a portion wall parallel to 3m side. There is liquid of specific gravity 1.6 to a height of 2.5m on one side and liquid of specific gravity 0.8 to a height of 1.5m on the other side. Find the total pressure experienced by the partition wall on each side and resultant pressure. Find the point of application of resultant force with respect to bottom of tank. **(CO1 K4) 8M**

UNIT-II

4. a. Explain about various classifications of flow. **(CO2 K2) 7M**

4. b. Determine the expression for velocity potential function for 2D flow given below.
   $u = xy^2 - 2y - x^3$; $v = y^3/3 + 2x - x^2y$. **(CO2 K2) 8M**

(or)

5. a. List the various types fluid flow (types of flow), define rotational and irrational flow and explain the possible combinations of above flows with examples. **(CO2 K2) 7M**

   b. A 45° deflection angle diffusing bend lies in a horizontal plane and tapers from 60cm to 30cm dia at the outlet. The pressure at the inlet is 15KPa and flow through the bend is 0.5 m^3/s. Assuming friction loss of 20% K.E at the inlet, compute the magnitude and direction of the resultant flow exerted by the water on bend. **(CO2 K2) 8M**

UNIT-III

6. a. Illustrate the principle of Orifice meter and derive an expression for rate of flow through it with a sketch. **(CO3 K3) 7M**

   b. A venturi meter has its axis vertical, the inlet and throat diameters being 150 mm and 75 mm respectively. The throat is 225 mm above inlet and K = 0.96. Petrol of specific gravity 0.78 flows up through the meter at a rate of 0.029 m3/s. Find the pressure difference between the inlet and throat? **(CO3 K2) 8M**

(or)

7. a. Obtain an expression for discharge through large rectangular orifice. **(CO3 K3) 8M**

   b. A tank has two identical orifices in one of its vertical side one above other. The diameter of orifice is 5cm. The upper orifice is 3m below the water surface and lower one 5m below the water surface. If the value of cc and cv for both orifices are 0.64 and 0.96, determine the total discharge and point of intersection of the two jets from its vertical side. **(CO3 K3) 7M**