7. a. Describe different parts of Venturimeter with a neat sketch and derive an expression to determine rate of flow through Venturimeter. 7M

b. The following data relate to an Orificemeter: diameter of the pipe is 254 mm, diameter of orifice is 120 mm, specific gravity of oil is 0.88, and reading of differential manometer is 400 mm of mercury. Determine rate of flow of oil. 8M

UNIT-IV

8. a. Derive an expression for loss of head due to friction. 7M

b. In a pipe of diameter 350 mm and length 75 m is flowing at a velocity of 2.8 m/s. Find the head lost due to friction using Darcy Weisbach formula and Chezy's formula for which C= 55. 8M

(or)

9. a. An oil of viscosity 9 poise and specific gravity 0.9 is flowing through a horizontal pipe of 60 mm diameter. If the pressure drop in 100 m length of the pipe is 1800 kN/m^2, determine rate of flow of oil, centre line velocity, total frictional drag over 100 m length and power required to maintain the flow. 8M

b. Define laminar flow and describe flow of viscous fluid between two parallel plates. 7M

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VR20 Reg. No: | | | | | | | | | | |

VELAGAPUDI RAMAKRISHNA

SIDDHARTHA ENGINEERING COLLEGE

(AUTONOMOUS)

II/IV B.Tech. DEGREE EXAMINATION, March, 2022

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

1. a. Differentiate kinematic viscosity and dynamic viscosity.

b. State Pascal's law.

c. Define velocity potential.

d. Classify the flows.

e. State momentum principle.

f. Calculate velocity of flow through pitot tube having head of 4 cm.

g. Sketch venturimeter .

h. Differentiate small and large orifice.

i. Classify minor losses.

j. Define critical velocity.

PART-B

4 x 15 = 60M

UNIT-I

2. a. Define density, specific gravity, viscosity and vapour pressure. Calculate the specific weight, specific mass, specific volume and specific gravity of a liquid having a volume of 6 m^3 and weight of 44 kN. **7M**

   b. Describe Newton's law of viscosity and a plate 0.05 mm distant from a fixed plate moves at 1.2 m/s and requires a force of 2.2 N/m^2 to maintain this speed. Find the viscosity of the fluid between the plates. **8M**

(or)

3. a. Discuss the relationship between absolute pressure, atmospheric pressure and gauge pressure. Given that barometric reading is 760 mm of mercury, intensity of pressure is 40 kPa. Express the intensity of pressure in S.I units, both gauge and absolute. **8M**

   b. Define total pressure and centre of pressure of a rectangular plate 2 m x 4 m is vertically immersed in water in such a way that 2 m side is parallel to the water surface and 2.5 m below it. Find the total pressure on the rectangular plate. **7M**

UNIT-II

4. a. Explain the description of fluid motion and list out types of fluid flows with an example. **7M**

   b. Describe types of flow lines and velocity for a two dimensional flow field is given by $V = (3 + 2xy + 4t^2)\,i + (xy^2 + 3t)\,j$. Find the velocity and acceleration at a point (1,2) after 2 sec. **8M**

(or)

5. a. A 6 m long pipe is inclined at an angle of 20 degrees with the horizontal. The smaller section of the pipe which is at a lower level is of 100 mm diameter and the larger section of the pipe is of 300 mm diameter. If the pipe is uniformly tapering and the velocity of water at the smaller section is 1.8 m/s, determine the difference of pressures between the two sections. **8M**

   b. 250 litres/sec of water is flowing in a pipe having a diameter of 300 mm. If the pipe is bent by 135 degrees, find the magnitude and direction of the resultant force on the bend. The pressure of the water flowing is 400 kN/m^2. **7M**

UNIT-III

6. a. A horizontal Venturimeter with inlet and throat diameters 300 mm and 100 mm respectively is used to measure the flow of water. The pressure intensity at inlet is 130 kN/m^2 while vacuum pressure head at the throat is 350 mm of mercury. Assuming 3 percent of head lost in between the inlet and throat, find the value of coefficient of discharge and rate of flow. **8M**

   b. Define hydraulic coefficients. A large tank has a sharp edged circular orifice of 930 mm^2 area at a depth of 3 m below constant water level. The jet issues horizontally and in a horizontal distance of 2.4 m, it falls by 0.53 m, the measured discharge is 4.3 lit/s. Determine coefficients of velocity, contraction and discharge for the orifice. **7M**

(or)