and 0.5 m vertical. Find the hydraulic coefficients Cv, Cc and Cd of the orifice. **8M**

UNIT-IV

8. a. Derive the expression to calculate the loss of head due to sudden enlargement of a pipeline. **7M**

   b. The velocity of water in a pipe of diameter 500mm and length 1000m is 7.5m/s. Determine the head lost due to friction and the power required maintaining the flow. Take kinematic viscosity of water as $0.3 \times 10^{-4} m^2/s$. **8M**

(or)

9. a. Derive the Hagen-Poiseuille expression for velocity distribution for viscous (laminar) flow through a circular pipe. **7M**

   b. An oil of specific gravity 0.85 and viscosity 0.75 $N.s/m^2$ flows through a horizontal pipe of diameter 60mm. The pressure drop between two sections 150m apart is 2750kpa. Find discharge in the pipe and maximum velocity. **8M**

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

VELAGAPUDI RAMAKRISHNA

SIDDHARTHA ENGINEERING COLLEGE

(AUTONOMOUS)

II/IV B.Tech. DEGREE EXAMINATION, MARCH, 2021

Third Semester

CIVIL ENGINEERING

17CE3303 FLUID MECHANICS

Time: 3hours ***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. Define specific weight with their units.

   b. Differentiate between Newtonian and Non-Newtonian fluids.

   c. What is the principle involved in manometers?

   d. List out the various methods for describing fluid motion.

   e. Define Stream function.

   f. What is an Impulse-momentum equation?

   g. Define stagnation point and state its relevance in fluid mechanics.

   h. Write down the working principle of Pitot tube.

   i. Differentiate between the pipes in parallel and pipes in series.

   j. Define Reynold's number and what is its significance?

PART-B

4 x 15 = 60M

UNIT-I

2. a. Explain the phenomenon of capillarity and derive the expression for height of capillary rise. **7M**

   b. If $5m^3$ of oil weighs 45 kN, calculate its specific weight, mass density and specific gravity. **8M**

(or)

3. a. With the help of a neat sketch, define atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure and give relation between these pressures. **7M**

   b. A rectangular plate 1.20m wide and 3.0m deep lies within a water body such that its plane is inclined at 45^0 to the horizontal and the top edge of the plate is 1.40m below the water surface. Determine the total pressure on one side of the plate and the location of the centre of pressure. **8M**

UNIT-II

4. a. Describe the various classifications of fluid flow. **7M**

   b. For the velocity components in a fluid flow given by $u = 2xy$ and $v = a^2 + x^2 - y^2$, show that the flow is a possible case of study incompressible fluid flow and irrotational flow. Obtain the relevant stream function and velocity potential. **8M**

(or)

5. a. State and prove Bernoulli's theorem. Also, state clearly the assumptions and limitations involved in the derivation. **7M**

   b. A 45^0 reducing bend is connected in a pipeline, the diameters at the inlet and outlet of the bend being 400mm and 200mm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet of the bend is 215.8 kN/m^2 and rate of flow of water is $0.5m^3/sec$. **8M**

UNIT-III

6. a. Explain the working of a Venturimeter and derive an equation for measuring the flow rate through a pipe with this device. **7M**

   b. An orifice meter with orifice diameter 10 cm is inserted in a pipe of 20 cm diameter. The pressure gauge fitted upstream and downstream of the orifice meter gives readings of 19.62 N/cm^2 and 9.81 N/cm^2 respectively. Co-efficient of discharge for the meter is given as 0.6. Find the discharge of water through pipe. **8M**

(or)

7. a. Derive a discharge expression for an external cylindrical mouth piece. **7M**

   b. Water is discharged through a 15 cm diameter orifice in the vertical side of an open tank at the rate of 190 liters per second. Water stands 15 m above the centerline of the orifice. A point on the jet measured from the vena contracta has co-ordinates 5 m horizontal