Code No : **19CET303**

R19

II B. Tech I Semester Regular Examinations, March - 2021

FLUID MECHANICS

(Civil Engineering)

Time : 3 Hours **Max. Marks : 60**

Note : Answer **ONE** question from each unit **(5 × 12 = 60 Marks)**

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UNIT-I

1. a) Define the following fluid properties: Density, specific weight and specific gravity of a fluid. [6M]

   b) A fluid weighs 1000 kg and occupies 1000 L. Determine its specific gravity, density and specific weight. [6M]

(OR)

2. a) Define and explain: (i) Atmospheric pressure (ii) Absolute pressure (iii) Gauge pressure (iv) Vacuum pressure. [6M]

   b) The pressure on a liquid is increased from 50 kPa to 100 kPa. The resulting volume change is 2%. Determine the bulk modulus of the liquid. [6M]

UNIT-II

3. a) Define (i) Stream line (ii) Path line (iii) Streak line. [6M]

   b) A rectangular surface of size 4m x 2m is kept vertically immersed in water such that its top surface is touching free water level. Calculate the total hydrostatic force acting on the surface and its center of pressure. [6M]

(OR)

4. a) Derive the equation of total and center of pressure for submerged horizontal plane in a fluid. [6M]

   b) Calculate the unknown velocity component if the fluid satisfy continuity equation: $u = 2x^2 - 2y^2$, $w = z^3 + 4xz + 2yz$. [6M]

UNIT-III

5. a) Explain the stream function and velocity function properties. [6M]

   b) Oil of specific gravity 0.9 flows in a pipe 300 mm diameter at the rate 120 L/s and the pressure at point A is 24.5 kPa. If the point A is 5.2m above the datum line, calculate the total energy at point A. [6M]

(OR)

6. a) Explain the procedure to calculate resultant force through a pipe bend. [6M]

   b) A tapered pipe of diameters 300 mm and 200 mm is laid parallel to the ground. The pressure intensity at the two ends are 250 kPa and 150 kPa respectively while a discharge of 50 L/s is flowing through the pipe. Compute the total energy at each of the two sections. Mention the direction of fluid flow in the pipe and justify. [6M]
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UNIT-IV

7. a) Describe the different types of orifices. [6M]

   b) Determine the length of a rectangular notch to be built across a rectangular channel. The maximum depth of water on the notch is 1.5m and the discharge is 1200 L/s. Assume $C_d = 0.6$. [6M]

(OR)

8. a) The discharge coefficient of a venturi meter is greater than that of an orifice meter. Justify. [6M]

   b) An orifice of 100 mm diameter is installed in a pipe of 200 mm diameter. Assuming $C_d = 0.6$, determine the discharge of water in the pipe if the difference in levels of mercury of a U-tube manometer shows 0.20m. [6M]

UNIT-V

9. a) Describe Reynold's experiment to classify the different types of flows. Discuss the patterns and salient observations from the experiment. [6M]

   b) Calculate the head loss when a pipe of diameter 250 mm is suddenly enlarged to a diameter of 500 mm. The rate of flow through the pipe is 200 L/s. [6M]

(OR)

10. a) Define and explain Total Energy Line and Hydraulic Gradient Line. [6M]

    b) Three pipes of length 600m, 400m, and 200 m having diameters of 0.5m, 0.4m and 0.3m are connected in series and are carrying a discharge of 5 m^3/s. Calculate the head loss through the pipes assuming friction factor as 0.02. [6M]

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