Roll No ....

AU/ME-4002-CBGS

B.E. IV Semester

Examination, June 2020

Choice Based Grading System (CBGS)

Fluid Mechanics

Time : Three Hours

Maximum Marks : 70

Note: i)   Attempt any five questions.

     ii)   All questions carry equal marks.

     iii) Assume data suitably.

1. a)   Define with mathematical expression: 7

     i)   Uniform and Non-uniform flow

     ii)   Steady and unsteady flow

     iii) One, two and three dimensional flow

   b)   State Newton's law of viscosity. Explain the importance of viscosity in fluid motion.   7

2. a)   Explain the following terms: 7

     i)   Path line

     ii)   Streak line

     iii) Stream line

     iv) Equipotential line

   b)   Derive Euler's equation for flow along stream line and deduce the Bernoulli's Equation for the same.   7

3. a) The inlet and throat diameters of horizontal venturimeter are 30cm and 10cm respectively. The liquid flowing through the meter is water. The pressure intensity at inlet is 13.734 kN/m² while vacuum pressure head at the throat is 37cm of mercury. Find the rate of flow. Assume that 4% of the differential heads is lost between the inlet and outlet. Find also value of Cd for venturimeter.   7

   b) Derive an expression for continuity equation.   7

4. a) Discharge Q of a centrifugal pump can be assumed to be dependent on density of liquid ρ, viscosity of liquid μ, pressure, impeller diameter D and speed N in R.P.M. Using Buckingham π-Theorem, show that: 7

$$Q = ND^3 \; \phi\left[\frac{g\,H}{N^2 D^2}, \; \frac{V}{ND^2}\right]$$

   b) What is drag and lift? Explain different types of drag on immersed body.   7

5. a) Find the head lost due to friction in a pipe of diameter of 300mm and length 50m, through which water is flowing at a velocity of 3m/s using Darcy equation and Chezy's formula for which L = 60. Given kinematic viscosity 0.01 stores.   7

   b) Derive an expression of velocity and shear stress distribution for laminar flow between fixed parallel plates.   7

6. a) Define Reynold's Number? What is its significance? List the characteristics of Laminar flow.   7

   b) Derive an expression for Total Pressure Force and depth of centre of pressure for a vertical surface submerged in water.   7

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7. a) Explain the different types of similitude. 7

 b) Define the following terms and write relevant equations
 for the same: 7
   i) Stagnation temperature
   ii) Stagnation pressure

8. Write notes on: 14
   i) Momentum Thickness
   ii) Sub sonic and Super sonic flow
   iii) Buoyancy
   iv) Surface Tension

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