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Roll No. :

B020312(020)

B. Tech. (Third Semester) Examination,

Nov.-Dec. 2021

AICTE (New-Scheme)

**CIVIL
(Mechanical Engineering Branch)**

INTRODUCTION to FLUID MECHANICS

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Part (a) of each question is compulsory. Solve any two from (b), (c) and (d).

Unit-I

1. (a) Define Newtonian and Non-Newtonian Fluid with examples. 4

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- (b) A rectangular plate 0.6 m wide and 1.2 m deep is submerged in an oil bath specific gravity 0.8. The maximum and minimum depths of the plate are 1.6 m and 0.75 m from the free surface. Calculate the hydrostatic force on one face of the plate, and the depth of center of pressure. 8
- (c) State and explain the principle of floating. How does it differ from the principle of buoyancy? 8
- (d) A piece of wood (specific gravity = 0.6) of 10 cm square in cross-section and 2.5 m long floats in water. How much lead (specific gravity = 12) need to be fastened at the lower end of the stick so that it floats upright with 0.5 m length out of water? 8

Unit-II

2. (a) Differentiate between the Eulerian and Lagrangian method of representation. 4
- (b) What is Continuity Equation? Derive continuity equation for three dimensional cartesian coordinate. 8
- (c) Water flows through a pipe AB 1.2 m diameter at 3 m/s and then passes through a pipe BC 1.5 m diameter. At C , the pipe branches. Branch CD is

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- 0.8 m in diameter and carries one-third of flow in AB . The flow velocity in branch CE is 2.5 m/s. Find the volume rate of flow in AB , the velocity in BC , the velocity in CD and the diameter of CE . 8
- (d) Distinguish between : 8
- Steady flow and un-steady flow,
 - Uniform and nonuniform flow,
 - Compressible and incompressible flow,
 - Rotational and irrotational flow,
 - Laminar and turbulent flow.

Unit-III

3. (a) Explain any one application of momentum equation. 4
- (b) Derive Euler's equation of motion along a streamline, and hence derive the Bernoulli's theorem. 8
- (c) A Venturi-meter is provided to measure the water flowing through a horizontal pipe of 25 cm diameter. The throat of the venturi-meter is 12 cm. The pressure of water flowing through the pipe is 1.5 bar and the vacuum measured at the throat is 30 cm of Hg. Find the water flow rate through the pipe. Take $C_d = 0.975$. 8

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(d) Describe the procedure of finding the forces on pipe bend. 8

Unit-IV

4. (a) Discuss minor losses in pipes. 4

(b) Derive an expression for calculating loss of head due to sudden contraction and due to sudden enlargement. 8

(c) Find the discharge through a trapezoidal channel of width 8 m and side slope of 1 horizontal to 3 vertical. The depth of flow water is 2.4 m and value of Chezy's constant $C = 50$. The slope of the bed of the channel is given 1 in 4000. 8

(d) Explain with neat sketch the Reynold's experiment and define Laminar and Turbulent flow. 8

Unit-V

5. (a) What is a mouthpiece? State its utility. 4

(b) Deduce a formula for computing discharge through an orifice and mention the factors taken care of by the coefficient employed in it. 8

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(c) What are the different types of notches? Explain Rectangular and Stepped notches. 8

(d) Explain with neat diagram the cippoletti and broad crested weir. 8