Roll No. ..... Total Pages : 3

002302

December 2023

B.Tech. (Civil / ENV) III SEMESTER

Fluid Mechanics (PCC-CED-201)

Time : 3 Hours] [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) Define the Reynolds Number. What does it indicate about the flow of a fluid, and why is it important in fluid dynamics? (1.5)

(b) Explain the concept of surface tension in fluids. (1.5)

(c) Differentiate between dynamic and kinematic viscosity in fluids. (1.5)

(d) What is the concept of capillary action in fluids? (1.5)

(e) Briefly explain the classification of flow in fluid mechanics (1.5)

(f) Explain the working principle of a piezometer and its application in measuring fluid pressure. (1.5)

(g) Explain Euler's equation of motion in fluid dynamics. (1.5)

(h) Describe the fundamental principles behind Bernoulli's equation. (1.5)

(i) What is dimensional analysis, and why is it an important tool in fluid dynamics? (1.5)

(j) Describe the main components of Buckingham's π-Theorem. (1.5)

PART–B

2. (a) Two horizontal plates are placed 1.77 cm apart, the space between them being filled with oil of viscosity 14 poises. Calculate the shear stress in oil if upper plate is moved with a velocity of 3.5 m/s. (10)

(b) A liquid having specific gravity = 0.9, find the density, specific weight and weight of one litre of that liquid. (5)

3. (a) Explain the condition of equilibrium of a floating body with neat sketches. (5)

(b) A uniform body of size 3 m long 2 m wide and 1 m deep floats in water . What is the weight of the body if depth of immersion is 0.8m ? Determine the meta-centric height also. (10)

4. A circular plate 3 m diameter is immersed in water in such a way that its greatest and least depth below the free surface is 4 m and 1.5 m respectively. Determine the total pressure on one face of the plate and position of centre of pressure. (15)

5. (a) What do you understand by Capillary Fall and Capillary Rise? Derive the expression for Capillary Fall. (5)

(b) A wooden block of dimensions 50 cm 25 cm 20cm floats in water with its shortest axis vertical. The depth of immersion of the block is 15 cm. Determine the metacentric height and state of condition of equilibrium. (10)

6. (a) List various types of major and minor losses in pipes. Explain all of them in detail with formulas. (10)

(b) Discuss the drag at different Reynolds number. What do you understand by Stream Line and Bluff Bodies? (5)

7. Explain the following terms :

1. Circulation.
2. Magnus effect.
3. Friction Drag.
4. Navier Stokes Equation.
5. Stokes Law. (15)