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Roll No. 2K21/CE/95

III SEMESTER

B. Tech. (Civil Engineering)

B.Tech

END TERM EXAMINATION

Nov/Dec-2022

CE 205 Fluid Mechanics

Time: 3 Hours

Max. Marks: 40

Note: Attempt any FIVE questions.
All questions carry equal marks.
Assume suitable missing data, if any.

- Q.1(a) What do you understand by "Kinematics of Fluid Flow"? [2][CO3]
- (b) Define (i) Steady flow; (ii) Uniform flow. [2][CO3]
- (c) What are the characteristics of (i) Laminar flow; (ii) Turbulent Flow. [2][CO3]
- (d) Explain the concept of "Stream Tube". [2][CO3]
- Q.2 (a) Draw a detailed neat sketch showing the development of boundary layer on flat stationary surface. [3][CO7]
- (b) What is laminar sublayer? How is the concept of laminar sublayer useful? [3][CO7]
- (c) Explain the terms: (i) Displacement thickness; (ii) Momentum thickness, used in boundary layer. [2][CO7]
- Q.3(a) A pipe having a 20 cm diameter branches into two pipes, one of the branch pipes has a diameter of 10 cm whereas the other has 5 cm, the flow in the larger branch pipe is two-third of the main pipe and the remaining is discharged through the smaller diameter branch pipe. If the average velocity of flow in any of the pipes, main or branch does not exceed 3 m/s, find the rate of flow in the main pipe. [4][CO3]

- (b) Derive a rational equation using dimensional analysis, for a pipe flow, having given the following quantities affecting the flow phenomenon:

F = the unit boundary friction against which the fluid flows

μ = the viscosity

ρ = the mass density

V = the velocity of flow

D = the pipe diameter

e = the pipe surface roughness

[4][CO6, 8]

- Q.4(a) What is model analysis? What are the advantages of model testing? Describe various modes of model distortion.

[4][CO6]

- (b) Describe various forms of energies present in fluid flow. Also write and explain the "General Energy Equation" for steady flow.

[4][CO4]

- Q.5(a) Determine the total pressure on a circular plate of diameter 1.5 m which is placed vertically in water in such a way that the centre of the plate is 3 m below the surface of water. Find the position of centre of pressure also.

[4][CO2]

- (b) A plate 0.025 mm distant from a fixed plate, moves at 60 cm/s on a fluid layer between the plates, and requires a force of 2 N per square metre surface in contact with fluid to maintain this speed. Determine the fluid viscosity between the plates.

[4][CO1]

- Q.6(a) The water is flowing through a pipe having diameters 20 cm and 10 cm at sections 1 and 2 respectively. The rate of flow through pipe is 35 litres/s. The section 1 is 6 m above datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 N/cm², find the intensity of pressure at section 2.

[4][CO3]

- (b) A crude oil of viscosity 0.97 poise and of specific gravity 0.9 is flowing through a horizontal circular pipe of diameter 100 mm and of length 10 m. Calculate the difference of pressure between the two ends of the pipe, if 100 kg of the oil is collected in a tank in 30 seconds.

[4][CO5]

- Q.7(a) Explain the Darcy – Weisbach equation for head loss in laminar flow through pipe. Whether this equation can be used for turbulent flow also? If yes, explain how.

[4][CO5]

- (b) Prove that for a steady laminar flow through a circular pipe, the velocity distribution across the section is parabolic and the average velocity is half of the maximum local velocity.

[4][CO5]