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Question Paper Code : 40292

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Third Semester

Civil Engineering

CE 8302 – FLUID MECHANICS

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define the term specific volume.
2. How do you determine the specific gravity for liquids and gas?
3. Write the expressions for equation of continuity.
4. Illustrate the specific application of pitot tube.
5. Write the principle of dimensional homogeneity.
6. Mention the three similarities required to achieve the similitude.
7. Write the Darcy Weisbach equation.
8. Illustrate the reasons for major and minor losses of fluid flow in pipes.
9. How do you define the term boundary layer?
10. Illustrate the classification of boundary layers.

PART B — ($5 \times 13 = 65$ marks)

11. (a) (i) Illustrate the SI units and dimension for pressure, density , work , power, dynamic viscosity, kinematic viscosity and surface tension. (6)

(ii) If 5 m^3 of certain oil weights 45 kN calculate the specific weight, specific gravity and mass density of the oil. (7)

Or

(b) Describe in detail about the Newtonian Fluids and non Newtonian fluids with neat diagram. (13)

12. (a) Describe in detail about the classification of fluid flow. (13)

Or

(b) With basic assumption derive the Bernoulli's equation for steady flow of an ideal fluid along a streamline with neat sketch. (13)

13. (a) Assuming that the viscous force (F) excreted by a fluid on a sphere of diameter (D) depend on the viscosity (μ) , mass density of the fluid (ρ) and the velocity of the sphere (v), find an expression for viscous force using dimensional analysis. (13)

Or

(b) On a fixed solid body, the force (F) exerted by a flowing fluid depends upon the length (L) of the body, velocity (V) of fluid , the density (ρ) of fluid, viscosity (μ) of fluid and acceleration due to gravity (g). Obtain an expression for the force using dimensional analysis. (13)

14. (a) Explain in detail about the procedure and observation of Reynolds experiment with formula required and with neat sketch. (13)

Or

(b) Obtain the Hagen-Poiseuille's expression for laminar flow of fluid in straight and circular pipe with proper assumptions and with neat sketch. (13)

15. (a) Explain in detail about the basic concept of boundary layer on a flat plate, boundary layer thickness, displacement thickness and momentum thickness with neat sketch. (13)

Or

(b) A sharp flat plate with $L = 1$ m and $b = 3$ is immersed parallel to a stream of velocity 2 m/s. Find the drag on one side of the plate, and at the trailing edge. Find the thickness δ, δ^* and θ for (13)

(i) air, $\rho = 1.23$ kg/m^3 and $\nu = 1.46 \times 10^{-5}$ m^2/s and

(ii) water, $\rho = 1000$ kg/m^3 and $\nu = 1.02 \times 10^{-6}$ m^2/s.

PART C — (1 × 15 = 15 marks)

16. (a) Explain in detail about the construction details and working principle of 'U' tube manometer and inclined tube manometer with neat sketches. (15)

Or

(b) Water flows through a pipe AB 1.2 meter in diameter at 3 m/s and then passes through a pipe BC 1.5 m in diameter. At C, the pipe has been divided into two branches. Branch CD is 0.8 m in diameter and carries 1/3rd of the flow in AB. The flows velocity in branch CE is 2.5 m/s. Find the volumetric flow rate in AB, velocity in BC, the velocity in CD and diameter of CE. (15)

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