

Reg. No. :

E	N	G	G	T	R	E	E	.	C	O	M
---	---	---	---	---	---	---	---	---	---	---	---

Question Paper Code : 50529

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Third Semester

Civil Engineering

CE 3301 — FLUID MECHANICS

(Regulations 2021)

For More Visit our Website
EnggTree.com

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the Reynold's transportation theorem in fluid mechanics.
2. What is the significance of the boundary layer theory in fluid mechanics?
3. Define stream function in fluid dynamics.
4. How is the moment of momentum equation used in fluid mechanics?
5. What are fundamental dimensions in dimensional analysis?
6. State Buckingham Pi theorem.
7. Justify, how does Moody diagram relate to pipe flow.
8. Define concept of equivalent pipes.
9. Differentiate between laminar and turbulent boundary layers.
10. What are the key factors that lead to the separation of the boundary layer?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Determine the surface tension acting on the surface of a vertical thin plate of 1 m length when it is lifted vertically from a liquid using a force of 0.3N. (6)
(ii) Explain the various properties of fluid. (7)

Or

(b) A U-tube manometer has both its limbs enlarged to 25 times the tube area. Initially the tube is filled to some level with oil of specific weight γ . Then both limbs are filled with fluid of specific weight γ , to the same level, both limbs being exposed to the same pressure. When a pressure is applied to one of the limb the manometric fluid rises by 'h' m. Derive an expression for the pressure difference in the limbs. In both cases assume that the liquid level remains the same in the enlarged section.

12. (a) A right angle triangle of 2 m \times 2 m sides lies vertically in oil of specific gravity 0.9 with one edge horizontal and at a depth of 2 m. Determine the net force on one side and its point of action.

Or

(b) Discuss the concept of stream line, streak line and path line with neat sketches.

13. (a) Describe the Rayleigh's method in dimensional analysis. How does it differ from the Buckingham Pi theorem, and in what situations is Rayleigh's method more suitable?

Or

(b) The volume flow rate, Q over a V-notch depends on fluid properties namely density ρ , kinematic viscosity ν , and surface tension σ . It is also influenced by the angle of the notch, head of fluid over the vertex, and acceleration due to gravity. Determine the dimensionless parameters using dimensional analysis which can correlate the variables.

14. (a) (i) Three pipes connected in parallel carries total discharge of 10 m³/sec. The system consists of 1800 m of 50 cm, 1200 m of 40 cm, and 600 m of 30 cm pipes of the same material. Find the product of discharges from all three pipes in m³/sec. Round off to one decimal place. (7)

(ii) Discuss with a neat sketch the hydraulic gradient line and total energy line used in analyzing fluid flow in pipes. (6)

Or

(b) (i) Three pipes of 400 mm, 350 mm and 300 mm diameter are connected in series between two reservoirs with a difference in level of 12 m. The friction factors are 0.024, 0.021 and 0.019 respectively. The lengths are 200 m, 300 m and 250 m respectively. Determine the flow rate neglecting minor losses. (7)

(ii) Explain the concept of major and minor losses in fluid flow through pipes. (6)

15. (a) Explain the concepts of drag and lift forces in fluid dynamics. How do these forces differ in terms of direction and impact on the motion of objects in a fluid.

Or

- (b) Discuss the concept of the momentum integral equation and its role in analyzing boundary layers.

PART C — (1 × 15 = 15 marks)

16. (a) Categorize various types of flow of fluids with graphical representation.

Or

- (b) At low velocities (laminar flow), the volume flow Q through a small-bore tube is a function only of the tube radius R , the fluid viscosity μ , and the pressure drop per unit tube length dp/dx . Using the Pi Theorem, find an appropriate dimensionless relationship for the given parameters.

