A   Reg. No. : ⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚⬚

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1.   What is a characteristic of Newtonian fluids?   CO1-U

  (a) Viscosity changes with shear rate   (b) Viscosity remains constant

  (c) They have high compressibility   (d) They do not flow under shear stress

2.   Pascal's law states that: CO1-U

  (a) Pressure increases with depth

  (b) Pressure applied to a confined fluid is transmitted undiminished

  (c) The buoyant force acts vertically upward

  (d) Viscosity is dependent on temperature

3.   The equation of continuity is based on the principle of: CO1-U

  (a) Energy conservation   (b) Mass conservation

  (c) Momentum conservation   (d) Thermodynamics

4.   Bernoulli's equation applies to: CO1-U

  (a) Viscous fluids   (b) Incompressible, non-viscous fluids

  (a) Viscous fluids   (b) Incompressible, non-viscous fluids

5.   Dimensional analysis is used primarily for: CO1-U

  (a) Calculating pressures   (b) Ensuring dimensional homogeneity

  (c) Measuring fluid properties   (d) Determining fluid velocity

6. Dimensional homogeneity means: _____   CO1-U

   (a) All dimensions are equal

   (b) All terms in an equation have the same dimensions

   (c) Different dimensions can be compared

   (d) No dimensions exist

7. Fluidization occurs when: CO1-U

   (a) Solids settle in a liquid   (b) Liquid flows through a solid

   (c) Solid particles are suspended in a fluid   (d) Fluid flows without any resistance

8. The minimum fluidization velocity is defined as: CO1-U

   (a) The velocity at which a fluid first moves through a bed of solids

   (b) The velocity at which all solids settle

   (c) The velocity required for complete mixing

   (d) Zero

9. Which type of pump is commonly used for high-viscosity fluids?   CO1-U

   (a) Centrifugal pump   (b) Diaphragm pump

   (c) Gear pump   (d) Vortex pump

10. The main advantage of a centrifugal pump is: CO1-U

   (a) High efficiency at low speeds   (b) Ability to handle solid particles

   (c) Continuous flow and high flow rates   (d) Compact design

<div align="center">PART – B (5 x 2= 10 Marks)</div>

11. Define fluid mechanics and its significance in chemical engineering.   CO1- U

12. Water flows through a pipe of 200 mm in diameter, 60 m long, with a velocity   CO2-App
of 2.5 m/s. What is the head loss due to friction using Darcy's formulae?
(Assume friction factor, f = 0.005)

13. Give an example of a physical situation where dimensional analysis can be   CO1- U
applied.

14. Define fluidization and explain its significance in industrial processes.   CO1- U

15. What is NPSH?   CO1- U

<div align="center">PART – C (5 x 16= 80 Marks)</div>

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16. (a) Explain Newton's law of viscosity and its importance in fluid mechanics. Compare and contrast the behavior of Newtonian and non-Newtonian fluids with suitable examples. — CO2-App (16)

Or

(b) Discuss in detail, the significance of fluid mechanics in chemical engineering. — CO2-App (16)

17. (a) Analyze the different types of fluid flow and their characteristics. — CO3-Ana (16)

Or

(b) Analyze the advantages and disadvantages of three different flow measurement techniques commonly used in industrial applications. Discuss how these methods can affect the accuracy and reliability of flow measurements in specific scenarios. — CO3-Ana (16)

18. (a) Discuss the distinction between fundamental and secondary dimensions and why secondary dimensions are important. — CO2-App (16)

Or

(b) Explain the Rayleigh method of dimensional analysis in detail. Discuss the steps involved and demonstrate their application with an example. — CO2-App (16)

19. (a) Discuss the types of fluidizations and their applications in chemical engineering processes. — CO1 - U (16)

Or

(b) Describe the conditions for fluidization and the concept of minimum fluidization velocity. — CO1 - U (16)

20. (a) Analyze the various classifications of pumps used in engineering applications. — CO4-Ana (16)

Or

(b) Describe pump sizing and its importance in pump selection. Discuss the role of NPSH in pump sizing. Explain how to calculate and evaluate $NPSH_a$ and $NPSH_r$ to prevent cavitation. — CO4 -Ana (16)

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