Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

THIRD SEMESTER B.TECH DEGREE EXAMINATION (Regular), FEBRUARY 2022
CHEMICAL ENGINEERING
(2020 SCHEME)

Course Code: **20CHT205**

Course Name: **Fluid and Particle Mechanics**

Max. Marks: **100** **Duration: 3 Hours**

Assume any missing data suitably

PART A

(Answer all questions. Each question carries 3 marks)

1. What do you mean by continuum mechanics of fluid. Explain with an example.
2. Define Shear Stress and Shear Strain.
3. Derive continuity equation for fluid flow.
4. Define Stream line and Path line with a figure.
5. Write the equation for head loss in a circular pipe with same area and velocity.
6. Write down the equation for Prandtl one seventh power law. Explain the terms used in it.
7. Write any 3 industrial applications of Fluidized bed process.
8. Define wall drag and form drag by mentioning its equation.
9. Draw the characteristic curves of a centrifugal pump.
10. What do you mean by positive displacement pump.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) With a neat figure, explain the working of Centrifugal decanter. (6)

    b) A U-tube manometer is used to measure pressure drop across an orifice meter. The manometric fluid is mercury (sp.gr. is 13.6) and fluid flowing through the pipeline is brine (sp.gr. is 1.26). When the pressure at taps are equal, the level of mercury in the manometer is one meter below the taps. In operating conditions, the pressure at the upstream tap is 115.324 kN/m^2 absolute and that at the downstream tap is 33.864 kN/m^2 below the atmospheric pressure. What is the reading of manometer in centimeters? (8)

OR

12. a) Derive Barometric equation for a compressible fluid starting from the basis of hydrostatic equilibrium equation (8)

    b) An open reservoir contains a liquid having a density of 1250 kg/m^3. At a certain point the gauge pressure is 32.424 kN/m^2. Calculate the height of the liquid level above the given point. (6)

MODULE II

13. a) State and derive Bernoulli's equation with a neat figure (8)
    b) What do you mean by Fluid Kinematics. Explain the motion of fluid with Lagrangian method. (6)

OR

14. Derive the Navier Stokes equation for Newtonian fluid in cartesian coordinate with a suitable figure. List out the various assumptions used. (14)

MODULE III

15. a) Derive Darcy Weisbach equation to estimate the head loss due to friction in a pipe by laminar flow of incompressible fluids. (8)
    b) Explain Hagen Poiseuille equation with a neat figure. (6)

OR

16. Derive Prandtl's Universal distribution equation. List out various characteristics of turbulent flow with a figure. (14)

MODULE IV

17. a) Derive Kozeny-Carman equation for the flow of fluid through packed bed (8)
    b) Derive Terminal settling velocity for spherical particles with low Reynolds number (6)

OR

18. Define fluidization. Derive the equation to estimate minimum fluidization velocity (14)

MODULE V

19. a) List out various classification of pumps. Explain any one with a neat figure (6)
    b) Explain working principle of a Centrifugal pump with a neat figure (8)

OR

20. Explain
    a) Gate valve and Globe valve with a neat figure (7)
    b) Any 3 joints and fittings with a neat figure. List out its applications. (7)

****