

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

**SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)**

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**THIRD SEMESTER B.TECH DEGREE EXAMINATION (Regular), DECEMBER 2022****(2020 SCHEME)****Course Code : 20CHT281****Course Name: Introduction to Chemical Engineering****Max. Marks : 100****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. List out any three major innovations in chemical engineering and describe them.
2. Explain the major activities in process development and process design.
3. The weight of an object is 300 N at a location where the acceleration due to gravity is  $9.81 \text{ m/s}^2$ . Express the mass in the FPS system.
4. Distinguish between vapor pressure and partial pressure.
5. Classify drying and evaporation based on their applications.
6. Elaborate on the unit operation which is used for separation based on relative volatility.
7. What is the mode of heat transfer occurring in solids? State the law governing that mode of heat transfer.
8. Compare the different types of fluid flow patterns.
9. List the methods for solid disposal systems.
10. List any six causes of industrial accidents.

**PART B*****(Answer one full question from each module, each question carries 14 marks)*****MODULE I**

11. a) Describe the history and evolution of chemical engineering as a profession. (7)  
b) Classify chemical industries based on their applications and give examples for each. (7)

**OR**

12. a) Elaborate the different roles of chemical engineers in industries. (8)  
b) Distinguish the major role of Chemist and Chemical Engineer. (6)

**MODULE II**

13. a) Thermal conductivity of pure iron is  $39 \text{ Btu}/(\text{ft h}^\circ\text{F})$ , and that of (6)

steel containing 1% C is 39 kcal / (m h°C). Which one is the best conductor?

- b) Pure alcohol and water are mixed to get 50% alcohol solution. The density (g/ml) of water alcohol and the solution may be taken to be 0.998, 0.780 and 0.914, respectively at 293K, Calculate the following (8)
- Molarity
  - Molality
  - Volume percent of ethanol in solution

**OR**

14. a) One kmol carbon dioxide occupies a volume of 0.381m<sup>3</sup> at 313 K. Compare the pressures given by the (7)
- Ideal gas equation
  - Van der Waals Equation
- Take constants as  $a=0.365 \text{ Nm}^4/\text{mol}^2$  and  $b= 4.28 \times 10^{-5} \text{ m}^3/\text{mol}$
- b) In the SI System thermal conductivity has the unit W/(m K). The thermal conductivity of solid material can be calculated as  $k=xQ/(A\Delta T)$ , where Q is the rate of heat transfer, x is the thickness of solid, A is the area of heat transfer and  $\Delta T$  is the temperature difference. The following values were obtained experimentally:  $Q=10000 \text{ KJ/h}$ ,  $A = 1 \text{ m}^2$ ,  $x =100\text{mm}$  and  $\Delta T =800\text{K}$ . (7)
- Calculate thermal conductivity in W/(m K)
  - Express the thermal conductivity in kcal/(h m°C)

**MODULE III**

15. a) Classify unit operations and unit processes and explain any one unit process. (8)
- b) Distinguish between leaching and extraction. (6)

**OR**

16. a) Explain briefly on biodiesel production. (7)
- b) A continuous distillation column is used to regenerate solvent for solvent recovery process. The column treats 200 kmol/h of a feed containing 10% (mol) ethyl alcohol and water. The overhead product is 89% (mol) alcohol, and the bottom product is 0.3% (mol) alcohol. Calculate the overhead and bottom product. Estimate the daily requirement of makeup alcohol for solvent extraction process. (7)

**MODULE IV**

17. a) With neat sketch classify the types of ideal reactors. (6)
- b) Describe briefly about the equipment that are used for transportation of fluids. (8)

**OR**

18. a) Explain the different types of flow diagram. (4)

- b) Describe briefly about the working principle of manometers and classify them. (10)

**MODULE V**

19. a) The Bhopal Gas Tragedy, 1984 was a catastrophe that had no parallel in the world's industrial history. Justify the major reasons that led to the tragedy. (8)
- b) What are the techniques used for solid waste management? Explain any two methods briefly. (6)

**OR**

20. a) Outline the working of a wastewater treatment plant with a neat diagram. (10)
- b) Describe the side effects of aerial spraying of Endosulfan on human beings. (4)

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