

2056
Bachelor of Science (FYUP)-Fourth Semester
Fourth Semester
Industrial Chemistry
Paper: Heat and Mass Transfer Processes

Time allowed: 3 Hours

Max. Marks: 67

NOTE: Attempt four questions in all, including Unit-4 (Question Nos. 7-20) which is compulsory and selecting one question each from Unit 1 - 3. The use of scientific calculators is not allowed.

x-x-x

UNIT-1

1. a) Differentiate between conduction, convection, and radiation. (4)
b) Explain heat transfer through a plane wall. (4)
c) Differentiate between natural and forced convection. (4)
d) Explain steady-state and unsteady-state heat transfer. (4)
2. a) Explain construction and working of shell and tube heat exchanger (1-1 and 1-2 type). (6)
b) Compare parallel flow, counterflow, and crossflow heat exchangers. (6)
c) Explain the concept of multipass heat exchangers. (4)

UNIT-2

3. a) Derive Rayleigh equation for differential distillation. (5)
b) Explain working and construction of Flash distillation. (8)
c) Explain vapour-liquid equilibrium and boiling point-composition diagrams in detail. (6)
4. a) Discuss the various factors which influence the drying rate. (6)
b) Explain classification of dryers with detailed working and construction. Also give advantages and disadvantages of different dryers. (10)

UNIT-3

5. a) Discuss the various factors affecting evaporation in detail. (8)
b) Explain the principle, working, construction and uses of Horizontal tube evaporator and Vertical tube evaporator. (8)
6. a) Write a note on filter media and filter aids. (4)
b) Describe construction and working of plate and frame filter press. (8)
c) Explain entanglement and attractive force mechanisms. (4)

UNIT-4

Multiple Choice Question (1 mark each)

7. Which mode of heat transfer does not require a medium?
 - a) Conduction
 - b) Convection
 - c) Radiation
 - d) All
8. Forced convection occurs due to:
 - a) Density difference
 - b) External force like pump or fan
 - c) Temperature gradient
 - d) Gravity

(2)

9. Finned tubes are used to:
- Reduce heat transfer
 - Increase surface area
 - Increase pressure
 - Reduce flow
10. Raoult's law is applicable to:
- Non-ideal solutions
 - Ideal solutions
 - Gases only
 - Solids
11. Azeotropes are mixtures that:
- Separate easily
 - Have no vapour phase
 - Boil at constant composition
 - Are always ideal
12. Bound water is:
- Easily removable
 - Chemically bound to solid
 - Free flowing
 - Vapour phase
13. Drum dryer is used for:
- Powders
 - Gases
 - Crystals
 - Slurries
14. Falling film evaporator is best for:
- Heat-sensitive materials
 - Metals
 - Gases
 - Solids
15. Impingement occurs when particles:
- Dissolve
 - Hit the filter media
 - Evaporate
 - Float
16. Define heat transfer and list its modes. (1 x 9)
17. What are the various applications of Heat exchangers in chemical processes? (2)
18. Define and explain relative volatility. (2)
19. What is equilibrium moisture content (EMC)? (2)
20. Explain depth filtration. (2)