

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTER B.TECH DEGREE EXAMINATION (R,S), DECEMBER 2023**FOOD TECHNOLOGY****(2020 SCHEME)****Course Code: 20FTT303****Course Name: Unit Operations in Food Processing****Max. Marks: 100****Duration: 3 Hours****Assume missing data suitably****PART A*****(Answer all questions. Each question carries 3 marks)***

1. Explain the various parts of evaporator
2. Describe the importance of unit operations in food processing
3. What are the different factors affecting rate of filtration?
4. Define the filter aid. Give the example of filter aid.
5. Write short notes on mixing index
6. What are the criteria of mixer effectiveness?
7. Explain liquid-liquid extraction using triangular diagram
8. Distinguish between lateral flow extraction and counter current extraction
9. What are the factors influencing distillation?
10. Define following terms: (a) Distillation (b) Relative volatility (c) Reflux ratio

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

11. a) A single effect evaporator is to concentrate 20000 kg/h of a solution (7)
having a concentration of 5 % salt to a concentration of 20 % salt
by weight. Steam is fed to the evaporator at a pressure
corresponding to the saturation temperature of 399 K. The
evaporator is operating at atmospheric pressure and the boiling
point rise is 7 K. Calculate the amount of liquor and vapor.

- b) Compare single effect and multiple effect evaporator (7)

OR

12. a) A single effect evaporator is fed with 5000 kg/h of solution (7)
containing 1 % solute by weight. Feed temperature is 303 K (30°C)
and is to be concentrated to a solution of 2 % solute by weight. The
evaporation is at atmospheric pressure (101.325 kPa) and area of

evaporator is 69 m². Saturated steam is supplied at 143.3 kPa as a heating medium. Calculate the steam economy and the overall heat transfer coefficient. Data: Enthalpy of feed at 303 K = 125.79 kJ/kg
Enthalpy of vapor at 101.325 kPa = 2676.1 kJ/kg
Enthalpy of saturated steam at 143.3 kPa = 2691.5 kJ/kg
Saturation temperature of steam = 383 K (110° C)
Boiling point of saturation = 373 K
Enthalpy of product = 419.04 kJ/kg
Enthalpy of saturated water at 383 K = 461.30 kJ/kg

- b) Recall the concept of phase equilibrium in evaporation. (7)

MODULE II

13. a) Derive the expression for constant rate and pressure filtration (7)
b) Discuss continuous rotary vacuum filter used for filtration with a neat sketch (7)

OR

14. a) Explain working of plate and frame filter with a neat diagram (7)
b) Define filter medium, write its ideal properties and explain factors affecting selection of filter medium (7)

MODULE III

15. a) Elaborate the working of mixers used for low viscosity liquids (7)
b) Determine the theory of solid mixing (7)

OR

16. a) Discuss on the calculation of power requirement by impeller (7)
b) Determine the theory of liquid mixing (7)

MODULE IV

17. a) A solution of picric acid in benzene contains 30 grams of picric acid per litre. 1 litre of this solution is to be shaken with water at 291 K to reduce the picric acid concentration to 4 g/l in the benzene phases. Calculate the quantity of water needed. Molecular weight of picric acid is 229, and the distribution coefficient K is given by $K = C_E / C_R = 0.548$ where, C_R = concentration of picric acid in water, mol/l
 C_E = concentration of picric acid in benzene, mol/l (7)
b) Explain on any two counter current leaching equipments (7)

OR

18. a) Explain the mechanism and working of supercritical fluid extraction (7)
b) Summarize liquid-liquid extraction using triangular diagram (7)

MODULE V

19. a) Explain in detail vacuum distillation. (7)
b) Draw a neat sketch of differential distillation and explain it in brief. (7)

OR

20. a) Write in brief with sketch on fractionating column. (7)
b) Explain in brief McCabe-Thiele method used for obtaining (7)
theoretical plates required for a given degree of separation
