

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI • EXAMINATION – WINTER • 2014****Subject Code: 161403****Date: 01-12-2014****Subject Name: Food Engineering Operations-II****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** 1. The decimal reduction time D at 121°C (D_{121}) and the value z for a thermophilic spore in whole milk were determined experimentally to be equal to 30 s and 10.5°C respectively. Calculate the D value at 150°C (D_{150}). **04**
 2. Define Z and F_0 value and represent it graphically. **03**
- (b)** 1. Mention two distinct purposes for the process of milk pasteurization. List out the advantages of Heat Exchangers over in-bottle processing in pasteurization. **04**
 2. What do you mean by Fouling of a heat exchanger? What are effects of fouling on the performance of a Plate Heat Exchanger (PHE)? **03**
- Q.2 (a)** Write a short note on flash distillation. Develop the equation for operating line of stripping section for binary mixture in distillation column with neat sketch. **07**
- (b)** Describe in brief about filter press and its principle of working. **07**
- OR**
- (b)** With help of diagram, describe briefly different types of direct contact food freezing system **07**
- Q.3 (a)** 1. What do you mean by lyophilisation? Write the basic steps involved in it. **03**
 2. Write short note on centrifugal extractor. **04**
- (b)** What is leaching and extraction? Write a short note on Bollman extractor. **07**
- OR**
- Q.3 (a)** A rectification column is available to recover 90% of the ethanol contained in an aqueous mixture, with a composition in weight for which the volatile component is 50%. Feed is introduced as a liquid-vapor mixture containing 50% liquid. When the column operates with a reflux ratio 50% higher than the minimum, a waste stream containing 90% water weight is obtained. Determine: (a) molar composition of the distillate; (b) feed plate; and (c) number of plates required if the global efficiency of the column is 80%. **07**
- Equilibrium Data of the Ethanol-Water System**
- | x | y | x | y |
|------|-------|-------|-------|
| 0.01 | 0.103 | 0.50 | 0.652 |
| 0.03 | 0.235 | 0.60 | 0.697 |
| 0.05 | 0.325 | 0.70 | 0.753 |
| 0.10 | 0.444 | 0.80 | 0.818 |
| 0.20 | 0.529 | 0.85 | 0.856 |
| 0.30 | 0.573 | 0.87 | 0.873 |
| 0.40 | 0.613 | 0.894 | 0.894 |
- (b)** Write a short note on the following **07**
1. Flow Diversion Valve (FDV)
 2. Holding Tube
- Q.4 (a)** Discuss mechanism of crystallization process in detail. **07**

- (b) List out different types of food freezing systems. Describe briefly the fluidized bed IQF freezing system. Mention two most common refrigerants used for immersion freezing system. **07**

OR

- Q.4 (a)** What are clarifiers and thickeners? Write a short note on Batch sedimentation. **07**
(b) Briefly explain the followings **07**

1. Scrapped surface crystallizer
2. Invariant crystals

- Q.5 (a)** Explain crystal growth in detail. **07**
A solution of picric acid in benzene contains 30 g of picric acid per liter. Calculate the quantity of water with which 1 liter of this solution must be shaken at 18°C in order to reduce the picric acid concentration to 4g/L in the benzene phase. Molecular weight of picric acid is 229 and the distribution coefficient K is given as 0.548.

- (b)** Write short notes on the followings **07**
1. Schiebel column
2. Rotocel extractor

OR

- Q.5 (a)** Define distribution co-efficient for extraction. Draw and explain equilateral triangular diagram for single stage liquid- liquid extraction process **07**
(b) Describe in brief about cake filtration and its principle. **07**
