Seat No.: _____ Enrolment No._____

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 ºC (D121) and the value z for a thermophilic spore in whole milk were determined experimentally to be equal to 30 s and 10.5 ºC respectively. Calculate the D value at 150 ºC (D150). **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 1. Scrapped surface crystallizer 2. Invariant crystals	**07**
Q.5	**(a)**	Explain crystal growth in detail. 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.	**07**
	(b)	Write short notes on the followings 1. Schiebel column 2. Rotocel extractor	**07**

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**

****