Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – VI (NEW).EXAMINATION – WINTER 2016

Subject Code: 2161403 **Date:24/10/2016**

Subject Name: Food Engineering Operations-II

Time: 10:30 AM to 01:00 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) A medium acid food is sterilized at 105 0C in a can to reduce the number of heat resistance organism (D120 = 0.24 min; z = 100C) from an initial count of 1 million per can to a probability of survival of 1 in million. Determine the D105 value of this organism. **04**

(2) Define homogenization. What are the factors that contribute to the enhanced stability of homogenized milk? **03**

(b) A continuous fractionating column is to be designed for separating 10,000 kg per hour of a liquid mixture containing 40 mole percent methanol and 60 mole percent water into an overhead product containing 97 mole percent methanol and a bottom product having 98 mole percent water. A mole reflux ratio of 3 is used. Calculate (i) moles of overhead product obtained per hour and (ii) number of ideal plates and location of the feed plate if the feed is at its bubble point. **07**

Equilibrium data:

x	*0.1*	*0.2*	*0.3*	*0.4*	*0.5*	*0.6*	*0.7*	*0.8*	*0.9*
y	*0.417*	*0.579*	*0.669*	*0.729*	*0.78*	*0.825*	*0.871*	*0.915*	*0.959*

Where *x* = mole fraction of methanol in liquid

And *y* = mole fraction of methanol in vapor

Q.2 **(a)** What do you mean by Fouling of heat exchangers? Briefly explain the types of fouling deposits in heat exchanger used in milk pasteurizer and their effect on performance. How descaling of heat exchanger is done? **07**

(b) Draw the line diagram of a HTST pasteurizer labeling each component and also describe the function of a regenerator in a HTST pasteurizer.. **07**

OR

(b) Name different types of food freezing systems. Describe briefly with Diagram:Plate freezing system, Immersion freezing system **07**

Q.3 **(a)** (1) A process was calculated such that the probability of spoilage from an organism with a D0 value of 1 min is 1 in 100,000 from an initial spore load of 100. To verify this process, an inoculated pack is made. **04**

Calculate the level of inoculum of an organism having a D0 value of 1.5 min that must be used on 100 cans such that a spoilage rate of 5 cans will be equivalent in lethality to the calculated process.

(2) In an experiment, the thermal death time (TDT) values for a microorganism were obtained as 1.5 minutes and 8.5 minutes at 121.1 0C and 110 0C, respectively. Determine the Z-values (0C) of the **03**

microorganism.

	(b)	Describe the construction, principle and working of a single stem flow diversion device (FDD) used in a HTST pasteurizer clearly showing forward flow and divert flow.	**07**

OR

Q.3	**(a)**	Define clarifiers. Write a short note on Batch sedimentation.	**07**
	(b)	List out different filter aids used in filtration. Write in brief about cake filtration and its principle.	**07**
Q.4	**(a)**	Advantages and applications of liquid-liquid extraction in food industry. Draw and derive equation single-stage liquid-liquid extraction process.	**07**
	(b)	What is distillation? Write a short note on simple distillation and also derive an equation for the same.	**07**

OR

Q.4	**(a)**	Explain Leaching with example .Write a short note on rotocel extractor for leaching.	**07**
	(b)	Describe in brief about Crystal growth and Circulating magma vacuum crystallizer.	**07**
Q.5	**(a)**	Write a short note on Mixer settlers for extraction.	**07**
	(b)	Discuss mechanism of crystallization process in detail.	**07**

OR

Q.5	**(a)**	Develop the equation for stripping section for distillation column for binary system with neat sketch.	**07**
	(b)	What do you mean by bactofugation and how is it done? Derive an expression for rising velocity of milk in a centrifugal disc bowl centrifuge indicating each variable with proper units.	**07**

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