Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2161403 **Date: 01/05/2017**

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 Short Questions **14**

1 What is magma?

2 Define flooding.

3 What is the purpose of baffled vessel in agitation of liquid products?

4 What is the driving force for crystallization of solute material?

5 State the indicator micro-organism for UHT milk sterilization.

6 Gentle agitation during milk heating is recommended during batch pasteurization. Justify.

7 As the reflux ratio in a continuous distillation column is increased the number of stages

a) increases b) decreases

c) remains constant d) exponentially increases

8 Define cavitation of flowing liquids.

9 What are limitations of batch pasteurization?

10 For a mixture of n-hexane and n-heptane calculate fractions of more volatile component in vapor phase having fractions in liquid as 0.24 and value of relative volatility 2.14.

11 Define Clarifixation.

12 Enlist the factors affecting on gravity separation.

13 What should be the value of selectivity for possibility of liquid-liquid extraction?

14 Which of the following is used as a filter aid?

a) Magma b) Sodium

c)diatomaceous earth d) none of these

Q.2 **(a)** Calculate the power requirement in hp for homogenizer if liquid product is flowing at the rate of 3000 liter/h and homogenizing pressure of 3500 psi. **03**

(b) Ripened Guava puree is sterilized at 108^0C in a can to reduce the number of heat resistant organism (D_{120} = 0.24 minutes, Z = 10^0C) from an initial count of 1.2 million per can to a probability of survival of 1 in million. **04**

i) Determine D_{108} value of this organism.

ii) What will be the total processing time for the stated condition?

(c) Discuss the advantages and limitations of Direct heating system in food sterilization plants. **07**

OR

(c) Explain process flow line for milk uperization with a diagrammatic representation. **07**

Q.3 **(a)** Derive Rayleigh's equation for differntial distillation. **03**

(b) Describe in brief about plate and frame filter with figure. **04**

(c) An aqueous ethanol solution, containing 40% in weight of the volatile component, is continuously fed to a rectification column with an objective to obtain two streams containing 88% and 5% in weight of ethanol. Also, it is desired to obtain a third stream containing 30% of the alcohol that is introduced, with feed its ethanol content 75% in weight. Calculate the number of theoretical plates for reflux ratio as 2. Feed is at its boiling point. **07**

OR

Q.3 **(a)** Define reflux ratio and write in brief on optimum reflux ratio. **03**

(b) Explain briefly the selection criteria for solvent to be used for liquid-liquid extraction. **04**

(c) Enumerate types of Unit operations. Derive an expression of Stripping section Operating line for fractional distillation. **07**

Q.4 **(a)** Write a short note on rotocel extractor. **03**

	(b)	Explain in detail about cake filtration.	**04**
	(c)	Draw and explain equilateral triangular diagram for a ternary system in which a pair of solvent used for extraction and solvent present in feed are partially miscible.	**07**

OR

Q.4	**(a)**	Write a short note on filter aid.	**03**
	(b)	Draw and explain Swenson walker crystallizer.	**04**
	(c)	What is crystallization? Explain in detail about super saturation, nucleation and crystal growth stages of crystallization.	**07**
Q.5	**(a)**	For cans of spinach puree, the F_0= 1.85 min. at 121.1^{0}C and Z=15^{0}C. Neglecting heat up time, determine the process time for adequate sterilization at 105^{0}C at the centre of the can.	**03**
	(b)	Briefly explain the working of disc bowl cream separator.	**04**
	(c)	Enlist different techniques used in food freezing. Explain continuous freezer with its operation mechanism and advantages over other methods.	**07**

OR

Q.5	**(a)**	Briefly explain bactofugation treatment.	**03**
	(b)	Compute the fat separation velocity in a centrifuge if diameter of fat globule is 5µm, radial position is 0.25 m in centrifuge and rotating speed of disc is 5500 rpm. (Density difference – 78 and Absolute viscosity – 1.45 cp).	**04**
	(c)	Explain homogenization process with diagrammatic representation. What will be the effect of homogenization on milk characteristics?	**07**

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