

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2024****Subject Code:3161403****Date:24-05-2024****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.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1 (a)** Do as directed. **03**
- i) State the primary and secondary objectives of pasteurization.
 - ii) Define homogenization.
 - iii) Define vacreation.

- (b)** Compare the salient features of direct heating system with indirect heating system. **04**

- (c)** What do you understand by leaching? Draw a well labeled diagram for Bollman extraction and explain the working in detail. **07**

- Q.2 (a)** What is flash distillation? **03**

- (b)** Define liquid-solid extraction. Explain Rotocel extractor with figure. **04**

- (c)** Draw a labeled diagram of continuous distillation with reflux. Explain stripping and rectification operation in continuous distillation. **07**

OR

- (c)** A feed of 50 mole % hexane and 50 mole % octane is fed into a pipe through a pressure reducing valve and then into a flash distillation chamber. The vapour and liquid leaving the chamber are assumed to be in equilibrium. If the fraction of the feed converted to vapour is 0.6, find the composition of the top and the bottom product. The following table gives the equilibrium data for this system: **07**

x	1	0.69	0.4	0.192	0.045	0
y	1	0.932	0.78	0.538	0.177	0

- Q.3 (a)** In an experiment the thermal death time (TDT) values for a microorganism were obtained as 1.2 minutes & 7.5 minutes at 121.1°C and 110°C respectively. Determine Z-value of the microorganism. **03**

- (b)** Differentiate between sterilization plants and pasteurization plant. **04**

- (c)** Explain the different types of fouling occurring in heat exchanger. Suggest the suitable remedies to reduce the heat exchanger fouling **07**

OR

- Q.3 (a)** Draw a well labeled food freezing curve with different phases. **03**

- (b)** Explain the working of continuous ice-cream freezer. **04**

- (c)** Explain homogenization mechanism with a diagrammatic representation. Discuss the effect of homogenization on physico-chemical properties of milk.. **07**

- Q.4 (a)** What is meant by Regeneration efficiency in heat exchanger? **03**

- (b) Enlist the different types of pasteurization processes employed for liquid food products along with temperature and time combination. **04**
- (c) Draw a schematic well labeled diagrammatic representation of High Temperature & Short Time Pasteurization process. Explain the process flow and operation. **07**

OR

- Q.4**
- (a) What is homogeneous nucleation? **03**
 - (b) Calculate the power requirement for homogenizer in horse power if the flow rate of liquid product is 2000 liter/hour, product feed temperature of 55°C and homogenization pressure of 190 kg/cm². Also, compute the outlet temperature of homogenized product. **04**
 - (c) Discuss the factors affecting gravity separation in a food system. **07**
- Q.5**
- (a) Name three types of crystallization equipment. Draw a diagram of any one. **03**
 - (b) Derive an equation for the velocity at which the fat globule will rise upward during centrifugal separation. **04**
 - (c) Ripened papaya puree is sterilized at 115°C in a can to reduce the number of heat resistant organism ($D_{120} = 0.34$ minutes, $Z = 9^\circ\text{C}$) from an initial count of 1 million per can to a probability of survival of 1 in million. **07**
 - a) Determine D_{115} value of this organism.
 - b) What will be the total processing time for the stated condition?

OR

- Q.5**
- (a) What are the consequences of excessive agitation during batch thermal processing? **03**
 - (b) Highlight the effect of following parameters on centrifugal cream separation. **04**
 - i. Fat content of feed
 - ii. Centrifugal bowl speed
 - (c) Discuss UHT processing of liquid food product with a diagrammatic representation. **07**
