Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering - SEMESTER - III EXAMINATION - WINTER 2025

Subject Code: BE03051031 **Date: 19-12-2025**

Subject Name: Introduction to Food Engineering & Technology

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.**

			Marks
Q.1	**(a)**	Define food engineering and explain its importance in food industries.	**03**
	(b)	Discuss various unit operations used in food processing with suitable examples.	**04**
	(c)	Explain the concept of system, control volume, and boundary with suitable examples from food processing.	**07**
Q.2	**(a)**	Explain the modes of heat transfer and their applications in food engineering.	**03**
	(b)	Derive Fourier's law of heat conduction and state its practical applications.	**04**
	(c)	A stainless-steel wall of thickness 0.01 m has an area of 2 m^2 and thermal conductivity of 16 W/m·K. The inner and outer surface temperatures are 373 K and 333 K respectively. Calculate the rate of heat transfer.	**07**
		OR	
	(c)	Explain the working of a double-pipe heat exchanger and its advantages in the food industry.	**07**
Q.3	**(a)**	Define mass balance and explain its importance in food process calculations.	**03**
	(b)	Explain the steps involved in performing a material balance with suitable examples.	**04**
	(c)	A fruit juice concentrate 20% solids is prepared by evaporating water from raw juice 10% solids. Calculate the amount of water removed if 1000 kg of raw juice is processed.	**07**
		OR	
	(a)	Explain the concept of energy balance in steady-state systems.	**03**
	(b)	Write a short note on enthalpy and its use in food process calculations.	**04**
	(c)	Discuss the significance of psychrometric charts in drying and air-conditioning for food industries.	**07**
Q.4	**(a)**	Define food preservation and classify preservation techniques.	**03**
	(b)	Explain the principle of thermal processing and its advantages.	**04**
	(c)	A food product is heated from 30°C to 90°C using a specific heat capacity of 3.8 kJ/kg·K for 50 kg of material. Calculate the total heat required.	**07**

OR

	(a)	Explain low-temperature preservation techniques with examples.	**03**
	(b)	Discuss non-thermal preservation methods used in modern food processing.	**04**
	(c)	Write a short note on chemical preservatives and their limitations.	**07**
Q.5	**(a)**	Discuss the organization and structure of a food processing plant.	**03**
	(b)	Explain the role of automation and instrumentation in modern food industries.	**04**
	(c)	List various government organizations regulating food safety and quality in India FSSAI, BIS, AGMARK, etc.	**07**

OR

	(a)	Explain the importance of good manufacturing practices GMP and HACCP in food industries.	**03**
	(b)	Write a short note on career opportunities and trends in food engineering.	**04**
	(c)	Explain briefly the concept of sustainability and green processing in food industry.	**07**

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