Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–V EXAMINATION – WINTER 2025

Subject Code:3150505   **Date:21-11-2025**

Subject Name: Particle and Fluid Particle Processing

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)**	How do various solid-liquid separation techniques work?	**03**
	(b)	How does the operation of spray drying utilize both solid and fluid phases?	**04**
	(c)	How can the settling velocity of particles be characterized, and why is it important for sedimentation processes?	**07**
Q.2	**(a)**	Define Mean particle size, drag coefficient, Pressure Mean Diameter.	**03**
	(b)	How can flocculation and coagulation improve solid-liquid separation processes.	**04**
	(c)	How do batch mixing and continuous mixing differ, and what are their advantages and disadvantages?	**07**

OR

			MARKS
	(c)	How does viscosity of the fluid influence the choice of agitator?	**07**
Q.3	**(a)**	Define minimum fluidization velocity and describe how it can be determined.	**03**
	(b)	Can static mixers be used for highly viscous fluids, and if so, how?	**04**
	(c)	What measures are in place to prevent leakage or spillage during transport?	**07**

OR

			MARKS
Q.3	**(a)**	Compare and contrast bubbling, circulating, and spouted fluidized beds.	**03**
	(b)	Describe the conditions under which a material will fluidize?	**04**
	(c)	Describe construction and working of belt conveying system.	**07**
Q.4	**(a)**	What are kneaders?	**03**
	(b)	Explain the significance of void fraction in fluidization.	**04**
	(c)	Given the following data, calculate the time required to complete the filtration process: Filtration area: 0.5 m² Filtration rate: 2×10^{-3} m³/s Cake resistance: 2×10^{12} m⁻¹ Viscosity: 1.5×10^{-3} Pa·s Pressure drop: 100 kPa	**07**

OR

			MARKS
Q.4	**(a)**	Differentiate between homogeneous and heterogeneous nucleation.	**03**
	(b)	What are the key differences between a slurry bed reactor and a fixed bed reactor?	**04**
	(c)	Derive an expression for the concentration of solute in solution during leaching as a function of time.	**07**
Q.5	**(a)**	What is the significance of the contact time in fixed bed reactors?	**03**

(b) What are the different stages of drying? Describe each stage briefly. **04**

(c) Given the following data, calculate the time required to filter 0.1 m³ of fluid: Filtration area: 0.8 m² Pressure drop: 150 kPa Fluid viscosity: 1×10^{-3} Pa·s Cake resistance: 3×10^{12} m⁻¹ Specific volume: 0.4 m³ per kg of cake **07**

OR

Q.5 **(a)** Define supersaturation and explain its role in crystallization. **03**

(b) Explain how the filtration rate changes over time in a filter press. **04**

(c) Describe construction and working of hydro cyclones. **07**

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