

Enrolment No./Seat No _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-V (NEW) EXAMINATION – WINTER 2024

Subject Code:3150405

Date:17-12-2024

Subject Name:Chemical Engineering Fundamentals 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.

	Marks
Q.1 (a) Define rate of reaction.	03
(b) Discuss the classification of mass transfer operations.	04
(c) Explain the classification of reaction in details with examples.	07
Q.2 (a) Enlist the types of solid diffusion.	03
(b) Discuss the eddy diffusion with example.	04
(c) Explain Fick's law of diffusion and concept of binary diffusivity.	07
OR	
Q.2 (c) Explain why for unidirectional binary diffusion $J_A = -J_B$.	07
Q.3 (a) Define Extraction.	03
(b) Explain two resistance theory.	04
(c) Derive statement of penetration theory of mass transfer coefficient along with neat sketch and assumptions used in it.	07
OR	
Q.3 (a) Define: i) Tie-line ii) Operating line iii) Solutropic solution	03
(b) Explain local and overall mass transfer coefficients.	04
(c) With the help of fluid flow and heat transfer, explain concentration profiles for mass transfer in laminar and turbulent regions.	07
Q.4 (a) Define Raffinate and Extract.	03
(b) Explain preparation of solids for leaching.	04
(c) Differentiate between packed tower v/s tray tower.	07
OR	
Q.4 (a) Enlist three industrial processes where extraction operation is used.	03
(b) Explain counter current multiple contact, Shanks system for leaching.	04
(c) For a given liquid flow rate, give step wise procedure to calculate minimum liquid to gas ratio for absorbers.	07

- Q.5** (a) Write the steps in general procedure of integral method of analysis. **03**
(b) Find the conversion for the reaction $A \rightarrow R$, after 1 hour in a batch reactor.
 $-r_A = 3C_A$ mol/lit.hr, $C_{A0} = 1$ mol/lit. **04**
(c) Derive performance equation for a CSTR. **07**

OR

- Q.5** (a) Briefly describe variable volume batch reactor **03**
(b) Liquid A decomposes by first order kinetics, and in a batch reactor 50% of A is converted in 5 minutes. How long it will take to reach 75% conversion? **04**
(c) Derive performance equation for an ideal batch reactor. **07**
