Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2023

Subject Code:3170510 Date:08-12-2023

Subject Name: Process Intensification

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 Process Intensification. Enlist the four applications of PI.	**03**
	(b)	Discuss the philosophy and opportunities of process intensification.	**04**
	(c)	Draw schematic of toolbox for Process intensification and explain it in detail.	**07**
Q.2	**(a)**	Explain the significance of intensified mixing in process industries.	**03**
	(b)	Define the HEX reactors. Explain the working principal of HEX reactor. .	**04**
	(c)	Describe the working principle of Rotor stator reactors: the STT reactor with neat sketch. Explain how it differs from spinning disc reactor (Only three points).	**07**
		OR	
	(c)	Describe the working of Oscillatory baffled reactors (OBRs) with neat diagram. Also, enlist the key benefits of OBR over rotating packed bed reactor (Any three).	**07**
Q.3	**(a)**	Define Tee mixers and Nebulizers.	**03**
	(b)	Discuss the environmental catalysts with two suitable examples.	**04**
	(c)	Enlist the four names of inline reactors. Describe motionless mixer with neat diagram. Also, explain the five benefits of motionless mixer over traditional agitation.	**07**
		OR	
Q.3	**(a)**	Briefly discuss the Hydrodynamics and Mass Transfer in Monoliths.	**03**
	(b)	Explain the significance of Reynolds number and Hydraulic diameter in motionless mixer.	**04**
	(c)	Explain the construction and working of ejectors as mixer used in process industries. Enlist the advantage and limitation of ejectors over static reactor (Two each).	**07**
Q.4	**(a)**	Define Three-Levels-of-Porosity (TLP) Reactors.	**03**
	(b)	Define Monolith reactors. Discuss the three applications of Monolith reactors in process industries with example.	**04**
	(c)	Discuss the process intensification in process of Absorption of NOx to reduce air pollution.	**07**
		OR	

Q.4	**(a)**	Membrane-Enclosed Catalytic Reactor (MECR).	**03**
	(b)	Define structure reactors. Give classification of structure reactors with typical examples.	**04**
	(c)	Discuss the barriers and future potential scope for hybrid separation processes in chemical process industries.	**07**
Q.5	**(a)**	Explain reactive distillation with suitable example (Only one).	**03**
	(b)	Explain the principle and working of Chart-flow heat exchanger. Enlist the name of two parameters which are to be intensified for the same.	**04**
	(c)	Discuss and explain a case study on production of Methyl Tertiary Butyl Ether in process industry.	**07**

OR

Q.5	**(a)**	Write a short note on Foam heat exchangers.	**03**
	(b)	Explain the principle and working of Microchannels heat exchangers. Enlist the name of two parameters which are to be intensified for the same.	**04**
	(c)	Discuss and explain a case study on production of Coke Gas Purification in process industry.	**07**

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