

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2021****Subject Code:3170510****Date:15/12/2021****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.

- Q-1** (a) What is process intensification? Explain the main benefits of process intensification. **03**  
 (b) Write a short note on Membrane Distillation. **04**  
 (c) Write a short note on printed circuit board heat exchangers. **07**
- Q-2** (a) State the various types of compact heat exchangers with applications. **03**  
 (b) What is area density? Compare the range of area density for various compact heat exchangers. **04**  
 (c) Draw schematic of toolbox for Process intensification. **07**
- OR**
- (c) Explain the working principle of spinning disc reactor. Discuss the Nusselt flow model for this reactor. **03**
- Q-3** (a) Write a short note on Reactive distillation. **03**  
 (b) What are structure reactors? Give classification of structure reactors with typical example. **04**  
 (c) Discuss the process intensification in process of Absorption of NO<sub>x</sub>. **07**
- OR**
- Q-3** (a) Explain the concept in Reactive absorption. **03**  
 (b) Write a brief note on micro heat exchangers. **04**  
 (c) Discuss in brief Catalytic Plate Reactor (CPR) with example of various reactions. **07**
- Q-4** (a) Discuss the applications of Monolith reactors with example. **03**  
 (b) Write a short note on Membrane enclosed catalytic reactor. **04**  
 (c) Explain the principle and working of foam heat exchangers. Which parameters are intensified? **07**
- OR**
- Q-4** (a) State unique point or application of **03**  
     1. Mixing on a spinning disc  
     2. Induction-heated mixer  
     3. Short path distillation  
 (b) State the name of various novel reactors used in process industry. **04**  
 (c) Discuss and explain case study of Methyl Acetate Synthesis as PI. **07**
- Q-5** (a) List out the existing and potential applications of extractive distillation. **03**  
 (b) What are the barriers and future potential scope for hybrid separation processes? **04**  
 (c) Discuss in brief process intensification in mixers. **07**
- OR**
- Q-5** (a) Explain the construction and working of ejectors as mixer. **03**  
 (b) Write a short note on static mixers. **04**  
 (c) Give a brief overview of structure reactors. **07**

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**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VII (NEW) EXAMINATION – SUMMER 2022****Subject Code:3170510****Date:08/06/2022****Subject Name:Process Intensification****Time:02:30 PM TO 05:00 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
<b>Q.1</b>	(a) Discuss the several objectives of Process Intensification.	<b>03</b>
	(b) Write a short note on various techniques of Process Intensification (PI) Applications.	<b>04</b>
	(c) Define Process Intensification and discuss advantages of Process Intensification with respect to safety, Environment and Energy.	<b>07</b>
<b>Q.2</b>	(a) Explain the Heat Integrated Distillation Trains.	<b>03</b>
	(b) Discuss the different Principles of Process Intensification	<b>04</b>
	(c) Discuss Rotating Packed bed reactor with neat sketch and applications in detail.	<b>07</b>
	<b>OR</b>	
	(c) Discuss working of Catalytic plate reactor with neat sketch , merits and demerits.	<b>07</b>
<b>Q.3</b>	(a) Explain the role of Environmental Catalysis in designing of reactors.	<b>03</b>
	(b) Explain the Gauzes, Structured Packings, Foams in field of reactors.	<b>04</b>
	(c) Discuss Mesh heat exchangers with neat sketch.	<b>07</b>
	<b>OR</b>	
<b>Q.3</b>	(a) Define Membrane absorption/stripping with suitable example.	<b>03</b>
	(b) Explain the Fundamentals of process modeling considering example of Methyl Acetate Synthesis.	<b>04</b>
	(c) Discuss Printed circuit heat exchanger in detail.	<b>07</b>
<b>Q.4</b>	(a) Write a short note on Ultrasound Atomization	<b>03</b>
	(b) Discuss the selection criteria of heat exchanger technology.	<b>04</b>
	(c) Discuss working of Spinning disc reactor with neat sketch, merits and demerits.	<b>07</b>
	<b>OR</b>	
<b>Q.4</b>	(a) Write a short note on Ejectors.	<b>03</b>
	(b) Discuss the advantages and disadvantages of plate heat exchangers.	<b>04</b>
	(c) Discuss Monolithic Catalysts and Reactors in detail.	<b>07</b>
<b>Q.5</b>	(a) Discuss the overview of structured reactors.	<b>03</b>
	(b) Explain dividing wall columns of distillation with neat sketch.	<b>04</b>
	(c) Discuss working of Extractive distillation operation with necessary diagram, merits and demerits.	<b>07</b>
	<b>OR</b>	
<b>Q.5</b>	(a) Discuss Mass Transfer in Monoliths structures.	<b>03</b>
	(b) Discuss Barriers and future prospects associated with Hybrid Separation.	<b>04</b>
	(c) Discuss working of Supercritical separation operation with necessary diagram, merits and demerits	<b>07</b>

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