



(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 151854**

Roll No.

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## B.Tech

### (SEM. VIII) THEORY EXAMINATION 2014-15 MULTIPHASE REACTOR DESIGN

Time : 3 Hours]

[Total Marks : 100

Note: Attempt **all** questions. **All** questions carry equal marks.

- 1 Attempt any **four** parts of the following: **5x4=20**
- (a) Discuss the various steps to design the tubular reactor.
  - (b) What is the effect of recycle in the performance of a reactor?
  - (c) Explain the effect of heat during catalytic reactions with the help of suitable example.
  - (d) Differentiate homogeneous catalyzed reaction and autocatalytic reaction.
  - (e) Differentiate between conversion and yield giving an example for each.
  - (f) Discuss the industrial reactors best suited for fluidized bed operation.

2 Attempt any **two** parts of the followings: **10x2=20**

- (a) Discuss the importance of catalyst in the chemical reaction and which types of catalyst are used in process industries
- (b) How will you establish the global rate of reaction? Discuss mass and energy balance equation for tubular flow reactor.
- (c) What do you understand by variable volume batch reactor? Differentiate it with constant volume batch reactor. Derive an expression of fractional conversion of reactant ( $X_A$ ) for a variable volume batch reactor.

3 Attempt any **two** parts of the followings: **10x2=20**

- (a) Discuss the design and control of tubular reactor system with both gas and liquid recycle.
- (b) What are the basic criteria and principle for design of a multiphase reactor?
- (c) What do you mean by poisoning of a catalyst? Explain the mechanism in detail with an example.

4 Attempt any **two** parts of the followings: **10x2=20**

- (a) What is multi phase and catalytic chemical reactors? Discuss its application in chemical industries with suitable examples.
- (b) Describe the mechanism of catalytic reactions. Explain the 'Impregnation method' for the preparation of catalyst with suitable example.

- (c) Define the term 'effectiveness factor' as used in solid gas catalyst reactions. Develop an expression for effectiveness factor for a straight cylindrical of pore length  $2L$ . Both ends of pore are open to reactant gas. A first order irreversible reaction,  $A \rightarrow R$ , occurs on the pore walls.
- 5 Write short notes on any **four** of the followings: **5x4=20**
- (a) Mixed flow fermentor
  - (b) Supported catalyst *vs* unsupported catalyst.
  - (c) Molecular sieve catalyst *vs* porous catalyst.
  - (d) Effect of temperature on conversion
  - (e) Catalyst deactivation
  - (f) Study state non isothermal reactor design
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