

Unit IV

No. of Printed Pages : 03

Roll No.

7. Explain Dispersion model in detail. 15
8. Derive equation of a first order reaction using segregation flow model. 15

AA-185

M. Tech. EXAMINATION, Dec. 2017

(First Semester)

(B. Scheme) (Main & Re-appear)

(CHE)

CHE-509-B

ADVANCED CHEMICAL REACTION
ENGINEERING

Time : 3 Hours]

[Maximum Marks : 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. Assume any missing data, if required.

Unit I

1. The rate law for the hydrogenation (H) of ethylene (E) to form ethane (A) over a cobalt molybdenum catalyst is : **15**

$$-r'_E = kP_E P_H / (1 + K_E P_E)$$

- (a) Suggest a mechanism and rate limiting step consistent with the rate law.
- (b) What was the most difficult part in finding the mechanism ?
2. Explain the shrinking core model in detail. **15**

Unit II

3. The first order reaction $A \rightarrow B$ was carried out over two different sized pellets. The pellets were contained in a spinning basket reactor that was operated at sufficiently high rotation speeds that external mass transfer resistance was negligible. The results of two experimental runs made under identical conditions are as given in Table. Estimate the Thiele modulus

and effectiveness factor for each pellet. How small should the pellet be made to virtually eliminate all internal diffusion resistance ?

	Measured Rate (mol/g cat.s)×10 ⁵	Pellet Radius (m)
Run 1	3.0	0.01
Run 2	15.0	0.001

4. Explain mass transfer with reaction in packet bed in detail.

Unit III

5. What are various factors to be considered in designing the isothermal and adiabatic fixed bed reactor ? Describe various design steps in detail. **15**
6. What do you mean by Slurry reactors ? Explain various designing steps involved in designing the slurry reactor in detail. **15**