

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2013****Subject code: 711602N****Date: 04-06-2013****Subject Name: Advance Kinetics and Reaction Engineering****Time: 10.30 am – 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. All notations have conventional meaning.

- Q.1** (a) Derive dispersion model with usual notations 07
 (b) For an unreacted core model for spherical particles of unchanging size, derive relation between time, radius and conversion for gas film control resistance 07

- Q.2** (a) With a neat diagram write about contacting patterns for heterogeneous reactions. 07
 (b) Describe kinetic regimes for mass transfer and reaction for fluid-fluid reactions. 07

OR

- (b) Discuss determination of rate controlling step for fluid particle reactions 07

- Q.3** (a) For a bio reactor describe in detail about stoichiometry and rate laws 07
 (b) Discuss different models for Fluidised bed reactor 07

OR

- Q.3** (a) Derive performance equation for a fluidized bed reactor 07
 (b) Derive equation for evaluating conversion for a Moving bed reactor 07

- Q.4** (a) Discuss design criteria for Bubble column reactor 07
 (b) Discuss working of trickle bed reactor with a neat sketch 07

OR

- Q.4** (a) Describe advantages and disadvantages for bubble column reactor. 07
 (b) For a trickle bed reactor discuss flow regimes in detail 07

- Q.5** (a) Discuss in detail formulation of chemical reactor optimization problem 07
 (b) Describe slurry reaction kinetics. Give industrial applications of slurry reactors 07

OR

- Q.5** (a) Write a short note on Loop reactors with neat sketch. 07
 (b) A slurry reactor is used to study the kinetics of slurry reaction. The following results are obtained when liquid volume is 220 cm³. Assuming chemical step on catalyst surface as rapid. Develop rate equation for rate of reaction based on unit volume of slurry. 07

Run	Gas liquid interfacial area, cm ²	gm-cat/cm ³ liquid	Rate based on interfacial area, -r _A
1	10	0.1	10
2	10	0.45	25
3	45	0.1	2.5
4	45	0.45	10
