

GUJARAT TECHNOLOGICAL UNIVERSITY**ME Semester –I Examination Feb. - 2012****Subject code: 711602N****Date: 13/02/2012****Subject Name: Advanced Kinetics & 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.

- Q.1** (a) Enlist optimization techniques and objective functions for reactor optimization. **07**
(b) Derive dispersion model with usual notations **07**
- Q.2** (a) For an unreacted core model for spherical particles of unchanging size, derive relation between time, radius and conversion for chemical reaction control. **07**
(b) Derive rate equation for instantaneous fluid-fluid reaction. **07**
- OR**
- (b) With a neat diagram write about contacting patterns for heterogeneous reactions. **07**
- Q.3** (a) For a bio reactor describe in detail about stoichiometry and rate laws **07**
(b) Explain : i) Rise velocity of bubbles, cloud and wake **07**
ii) Bed fraction in bubbles, cloud and wake
- OR**
- Q.3** (a) Derive equation for evaluating conversion in case of a fluidized bed reactor **07**
(b) A catalytic reaction $A \rightarrow B$ is carried out in a Moving Bed reactor at 480°C . The reaction follows first order kinetics with a rate constant having value 0.6 min^{-1} . The catalytic deactivation also follows first order kinetics with a decay constant of 0.65 min^{-1} . The reactor contains 18000 gm. of catalyst and moves through reactor at a rate of 15 kg/min. The feed is fed at a rate of 30 mol/min at a concentration of 0.065 mol/dm^3 . Calculate the conversion that can be achieved in the reactor. **07**
- Q.4** (a) Describe various factors affecting performance of Bubble column reactor **07**
(b) For a trickle bed reactor write about Liquid side mass transfer and liquid solid mass transfer **07**
- OR**
- Q.4** (a) Describe advantages and disadvantages for bubble column reactor. **07**
(b) Write about pressure drop and liquid holdup in a trickle bed reactor. **07**
- Q.5** (a) Describe briefly about “Loop reactors” with neat sketch. **07**
(b) Write briefly about construction, applications, advantages and disadvantages for “Monolithic reactors” **07**
- OR**
- Q.5** (a) Describe slurry reaction kinetics. Give industrial applications of slurry reactors **07**
(b) Discuss about selection criteria between agitated vessel type reactor and loop reactor. **07**
