Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2013

Subject code: 711602N **Date: 04-06-2013**

Subject Name: Advance Kinetics and Reaction Engerring

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 onñLoop reactorsò 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 cm^3.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

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