Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VI SEMESTER B.TECH (CHEMICAL ENGINEERING)

END SEMESTER EXAMINATIONS, April 2017

SUBJECT: CHEMICAL REACTION ENGINEERING 2 [CHE 306]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 100

Instructions to Candidates:

- Answer **any FIVE full** questions.
- Missing data may be suitable assumed.

1A. A pulse input is given into a closed vessel which has reactant A (liquid) forming B. Calculate the conversion of reactant A in the real reactor if k = 0.2 min^{-1}? **12**

C_{pulse}, g/m^3	0	1	4	7	10	8	6	4	2	0.8	0
t, min	0	1	2	3	5	6	7	8	9	10	12

1B. Write a note on temperature effects on equilibrium conversion. **08**

2. A catalyst particle consists of cylindrical pores and a single first order reaction occurs within the pores under isothermal conditions, without any change in volume. Develop expressions to find the concentration profile in the pore and also sketch the concentration profile inside the pore. What is the importance of effectiveness factor? **20**

3A. For an elementary liquid-phase reaction A↔B. Determine the adiabatic equilibrium temperature and conversion when pure A is fed to the reactor at a temperature of 330K. **12**
Data: ΔH^o_A = -20000 cal/mol
ΔH^o_B = -25000 cal/mol;
$C_{pA} = C_{pB}$ = 22 cal/ mol K;
K = 10000 at 298 K.

3B. Explain in detail as to how catalysts are prepared? **08**

4A. With a neat sketch relate time and conversion for a spherical particle with an ash layer, when the controlling resistance is diffusion through the ash layer. **12**

4B. Develop an interim rate expression for the following catalytic reaction when surface reaction is the rate controlling step. A → B. (Single site mechanism) **08**

5A. Uniform-sized spherical particles UO_3 are reduced to UO_2 in a uniform environment with the following results: **10**

t, hr	0.180	0.347	0.453	0.567	0.733
X_B	0.45	0.68	0.8	0.95	0.98

If reaction follows the SCM, find the rate controlling mechanism and a rate equation to represent the reduction.

5B.	Write a note on Ignition-Extinction temperature and Multiple steady states	**10**
6.	With a neat sketch explain in detail the kinetics involved in a Slurry reactor. Explain how resistances are obtained and controlled.	**20**