Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH. END SEMESTER EXAMINATIONS APR 2018

SUBJECT: CHEMICAL REACTION ENGINEERING 2 [CHE 3202]

REVISED CREDIT SYSTEM
(20/04/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:
- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A.	A reactor is used to carry out the reaction A→R, $-r_A = 0.05C_A$, mol/(l.min). C: 35, 38, 40, 40, 39, 37, 36, 35 t, min: 0, 10, 20, 30, 40, 50, 60, 70 Calculate conversion assuming a). Plug flow b). Mixed flow and c). The Tank in series model.	**07**
1B.	Obtain an equation for conversion by using Bypassing and Dead space as the two parameters.	**03**
2A.	A reversible elementary reaction A↔ B is carried out in a CSTR with pure A entering the reactor. a) Derive an expression (or set of expressions) to calculate G(T) as a function of Heat of reaction, equilibrium constant, temperature, and so on. Show a sample calculation for G(400 K). b) What are the Steady state temperatures and which of them are locally stable? c) What is the conversion to the upper steady state? **Data**: UA = 3600 cal/min.K; $C_{PA} = C_{PB}$ = 40 cal/mol.K; E/R = 20,000 K; ΔH_{RX} = -80000 cal/mol A; K_{eq} = 100 at 400 K; k = 1 min^{-1} at 400 K; V = 10 dm^3; $\mathbf{v_o}$= 1 dm^3/min; F_{AO} = 10 mol/dm^3; $T_a = T_o$ = 37 °C.	**07**
2B.	Write a short note on multiple steady states.	**03**
3A.	With a neat sketch derive the relation between time and conversion for small non-shrinking particle when chemical reaction is the rate controlling step.	**05**
3B.	For a certain fluid-particle reaction, represented by A(g) + bB(s) → products, it is proposed to change some of the operating parameters as follows: the particle size R_1 is to be tripled to R_2 and the temperature is to be increased from T_1 = 800 K to T_2 = 900 K. What would the partial pressure (P_{Ag2}) be, if the original partial pressure (P_{Ag1}) was 2 bar, in order that the fractional conversion (X_A) be unchanged for a given reaction time? The particles are spherical, and reaction rate is controlling for the shrinking-core model. For the reaction, E_A/R = 12,000 K.	**05**

4A.	Explain in detail the kinetics involved in Slurry reactors.	**07**
4B.	Mention the important assumptions that were employed in Langmuir's adsorption isotherm.	**03**
5A.	Find an interim rate expression for the following catalytic reaction when adsorption is the rate controlling step (single site mechanism with inhibition). $A \rightarrow B$.	**07**
5B.	Write a note on the classification of catalyst poisons.	**03**