Registration No : | | | | | | | | | | |

Total Number of Pages : 01 **B.Tech**
PCCH4305

6th Semester Back Examination 2018-19
CHEMICAL REACTION ENGINEERING
BRANCH : CHEM
Time : 3 Hours
Max Marks : 70
Q.CODE : F749

Answer Question No.1 which is compulsory and any FIVE from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**

a) What are elementary reactions? Give an example.
b) Write the energy balance equation for an exothermic reaction.
c) Define order and molecularity.
d) Define ideal reactor.
e) Write the significance of Damkohler Number.
f) Differentiate Space time and Space Velocity.
g) Mention the non-ideality parameters in a batch, PFR and MFR.
h) Explain Macro and Micro Fluids.
i) Define activation energy?
j) What are Autocatalytic Reactions?

Q2 **a)** Classify the different types of reactions based on different parameters **(5)**
b) Derive an expression for E- Curve for pulse input in a MFR. **(5)**

Q3 **a)** Derive an expression for ideal recycle reactors. **(5)**
b) Differentiate between Differential and integral method of finding the rate equations. **(5)**

Q4 Liquid reactant A decomposes as per the following kinetics **(10)**
$A \rightarrow R$, $r_R = 0.40\ C_A^2$, $mol/m^3.min$
$A \rightarrow S$, $r_S = 2\ C_A$, $mol/m^3.min$
A feed of aqueous A with $C_{A0} = 40\ mol/m^3$ enters a reactor, decomposes and a mixture of A, R, S leaves the reactor. Find the concentration of A, R, S and time for 90% conversion of A in a PFR.

Q5 Assuming a stoichiometry $A \rightarrow R$ for a first order gas phase reaction, the size of PFR required to achieve 99% conversion of pure A is 32 L. Infact, the stoichiometry if the reaction is $A \rightarrow 3R$. For this corrected stoichiometry, find the required size of the same reactor type **(10)**

Q6 The data given below represent a continious response to a pulse input into a closed vessel which is to be used as a chemical reactor. Calculate the mean residence time of fluid in the vessel, and tabulate and construct E- Curve. **(10)**

T, min	0	5	10	15	20	25	30	35
C, g/l	0	3	5	5	4	2	1	0

Q7 Find the expression for volume (V) for the reaction A+ B → Product, for a PFR with a variable density system, C_{A0} is not equal to C_{B0}. **(10)**

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) Transition State Theory
b) Arrhenius Theory
c) Collision Theory