Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of MAHE)

VII SEMESTER B.TECH (CHEMICAL ENGINEERING)

END SEMESTER EXAMINATIONS, DEC 2021

SUBJECT: (PE V) CHEMICAL REACTOR THEORY [CHE 4061]

Time: 75 min MAX. MARKS: 20

Instructions to Candidates:

- Answer **all** questions.
- Missing data may be suitable assumed.

1A.	Say a reaction A + 2B → 2C + D is conducted in an adiabatic CSTR, what is the reactor volume and space-time necessary to achieve 35% conversion of A? The reaction rate is first order in *A* and second order in B. ***Data:*** ΔH_R = - 370.1 kJ/mol; T_O = 303 K Cp_A = 84.5 J/(mol K); F_{AO} = 10 mol/min Cp_B = 137 J/(mol K); F_{BO} = 30 mol/min Cp_C = 170 J(mol K); v_0 = 1000 L/min Cp_D = 75 J/(mol K); C_{AO} = 0.01 mol/L $k = 0.090 \exp [(40 \text{ kJ/mol})/R (1/303 – 1/T)] (\text{L/mol})^2 (\text{min})^{-1}$	**05**
1B.	Write a note on Multiple Steady States	**03**
1C.	Find an interim rate expression for the following catalytic reaction when surface reaction is controlling. A + B → X + Y	**02**
2A.	Spherical particle of zinc blend of size 3 mm, ρ_B = 2.9 g/cc in a 21% oxygen stream of high velocity at 801°C and 1 atm., undergoes the reaction as follows: $2 ZnS + 3 O_2 \rightarrow 2 ZnO + 2 SO_2$; Rate constant k'' = 13 cm/s. De = 0.08 cm^2/s. Using the following data calculate the time required for complete conversion of the particle? (Zn-65 g/gmol)	**04**
2B	Derive the equation employed to solve the question 2A	**03**
2C.	Explain how the resistances are obtained for slurry reactor kinetics	**03**