

First Periodical, October, 2021
B.E. (Chemical), IIIrd year , Vth sem.
Chemical Reaction Engineering – I

M.M. : 25

Time : 60 mins

Note:

- Please write your Class/Univ roll number, class and name at the top of all the pages/answer sheets and the graph.
- Attempt all questions.
- Scan all the pages/answer sheets and the graphs as a single pdf file and upload the same in the google form sent in the Google classroom. ***The Google form will stop taking responses at sharp 1.00 pm today i.e. 18.10.2021***

I. The decomposition of reactant A at 400°C for pressures between 1 and 10 atm follows a first order rate law. Show that a mechanism similar to azomethane decomposition is consistent with the observed kinetics. (5)

II. For an irreversible trimolecular type third order reaction, $A + B \rightarrow R$, develop the rate equation when (a) $M \neq 1$ (b) $M = 1$
 The reaction is first order w.r.t A and second order w.r.t B (6)

III. Reactant A decomposes in a batch reactor. The composition of A is measured at various times and the results are (8)

Time, s	0	10	19	25	37	57	70	120	200	300
Conc, mol/liter	16	14	12	10	8	6	5	3	2	1

Find the rate equation by using half life method.

IV. The thermal decomposition of hydrogen iodide $2HI \rightarrow H_2 + I_2$ is reported as :

T, °C	508	427	393	356	283
k, cm ³ /mol.s	0.1059	0.0031	5.88×10^{-4}	80.9×10^{-6}	0.942×10^{-6}

Find the complete rate equation for this reaction. Use units of joules, moles, cm³ and seconds

OR

Gaseous reactant A decomposes as $A \rightarrow 3R$. Find the conversion of A in a 50%A-50% inert feed ($v_0 = 180$ liter/min, $C_{A0} = 300$ mmol/liter) to a 1m³ mixed flow reactor.

Given that $-r_A = (0.6 \text{ min}^{-1})C_A$