國立雲林科技大學 107 學年度 碩士班招生考試試題

系所：化材系

科目：化工動力學

1) (10%) Please briefly describe the characteristics, usage, advantages, and disadvantages of Continuously Stirred Tank Reactor (CSTR).

2) (10%) Please explain why third order reaction will be affected more by pressure drop than second order reaction.

3) (20%) The dimerization, $2A_{(g)} \rightarrow A_{2(g,l)}$, is carried out isothermally and without pressure drop in a PFR at 298 K and 3.5 atm. As the concentration of A_2 increases down the reactor and A_2 begins to condense. The vapor pressure of A_2 at 298 K is 0.5 atm. If an equal molar mixture of A and inert, I, is fed to the reactor, at what conversion of A will A_2 begin to condense? (**Hint**: condensation is happened at saturation vapor pressure)

4) (20%) The irreversible elementary reaction $A_{(g)} \rightarrow B_{(g)}$ is conducted in a *tubular reactor system* consisting of 40 parallel 10 m long tubes with a 5 cm inside diameter. Compound A has a molecular weight of 100 with idea gas behavior. The feeding rate is 314 kg per hour of pure A and the operating pressure of 8.2 atm. It is known that the reaction rate constant for this first-order reaction is 3 hr^{-1} at 300 K and 9 hr^{-1} at 400 K. What conversion can be achieved if operating temperature set at 500K?

5) (20%)The gas-phase decomposition of compound A, $A \rightarrow B+2C$, was carried out isothermally in the lab, in which the total pressure was recorded with time. The data shown in table 1 apply to this reaction and only pure A was present initially in the reactor. Please determine this reaction order by the differential method and the integral method, respectively.

Table 1.

Time (min)	Total Pressure (mmHg)
0	8
2.5	11
5	13
10	16
15	18
20	20

6) (20%) As an isomerization of n-pentene to i-pentene over alumina. Please show (1) adsorption, (2) surface reaction, and (3) desorption reaction mechanisms and rate expressions. If the surfactant reaction is a rate-limiting step, please derive the rate law.