

## 淡江大學九十二學年度碩士班招生考試試題

系別：化學工程與材料工程學系

科目：化工熱力學 50%

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○	簡單型計算機

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- Assuming that Raoult's law applies, determine the bubblepoint pressure  $P_b$  and the dewpoint pressure  $P_d$  at  $110^\circ\text{C}$  for an overall system composition of 45 mole% n-octane (1), 10 mole% 2,5-dimethylhexane (2), and 45 mole% 2,2,4-trimethylpentane (3). (20%)  
The pure-component vapor pressure at  $110^\circ\text{C}$  are:  $P_1^{\text{sat}} = 64.24 \text{ kPa}$ ,  $P_2^{\text{sat}} = 104.06 \text{ kPa}$ , and  $P_3^{\text{sat}} = 137.8 \text{ kPa}$ .
- A perfectly insulated rigid container of total volume  $V^t$  is divided into two parts by a partition of negligible volume. One side of the partition contains  $n$  moles of an ideal gas with constant heat capacities at a temperature  $T_i$ , and the other side is evacuated (totally empty). If the partition is broken, calculate  $Q$  (heat transfer),  $W$  (work transfer), and  $\Delta U$  (internal energy change) for the process and calculate the final temperature and pressure,  $T_f$  and  $P_f$ , of the gas. (15%)
- Heat is transferred from a heat reservoir at  $280^\circ\text{C}$  to another heat reservoir at  $5^\circ\text{C}$ . If the amount of heat transferred is  $100 \text{ kJ}$ , what is the total entropy change as a result of this process? (15%)

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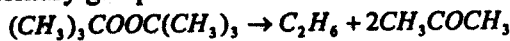
系列：化學工程與材料工程學系      科目：化學反應工程 50%

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### 1. The elementary gas-phase reaction

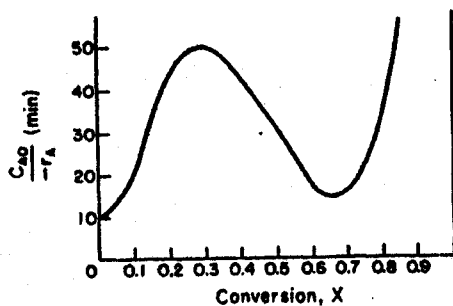


is carried out isothermally in a flow reactor with no pressure drop. The specific reaction rate at 50 °C is  $10^{-4} \text{ min}^{-1}$  and the activation energy is 85 kJ/mol. Pure di-*tert*-butyl peroxide enters the reactor at 10 atm and 127 °C and a molar flow rate of 2.5 mol/min. Calculate the reactor volume and space time to achieve 90% conversion in:

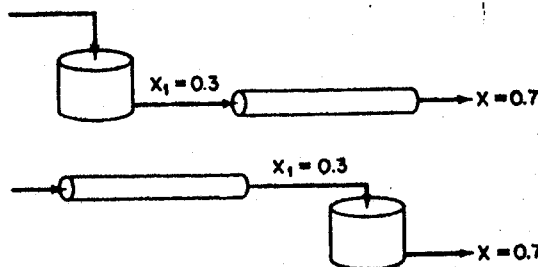
- (a) a CSTR (10 pts)
- (b) a PFR (10 pts)

### 2. The following figure shows $C_{A0}/-r_A$ versus $X_A$ for a nonisothermal, nonelementary, multiple-reaction liquid-phase decomposition of reactant A.

- (a) Consider the two systems shown in figure (b) in which a CSTR and PFR are connected in series. The intermediate conversion is 0.3 and the final conversion is 0.7. How should the reactors be arranged to obtain the minimum total reactor volume? Explain.
- (b) If the volumetric flow rate is 50 L/min, what is the minimum total reactor volume?
- (c) Is there a better means (i.e., smallest total volume achieving 70% conversion other than either of the systems proposed above)? (30 pts)



(a)



(b)

◀ 注意背面尚有試題 ▶