科目：輸送現象與單元操作
考試時間：100 分鐘

系所：化學工程及材料工程學系
（甲組）
本科原始成績：100 分

是否使用計算機：是

1. An ideal binary mixture (A + B) was separated by distillation. (i) $x_A=0.5$ and $y_A=0.8$, what is the relative volatility? (ii) Calculate the minimum reflux ratio for this system with $x_F=0.5$ and $x_D=0.95$ of component A for (i) feed is saturated liquid and (ii) feed is saturated vapor, respectively. **(25%)**

2. A naphthalene ball (A) having an initial radius of R_o evaporates into a stagnant air (B). **(25%)**

   (i)   Derive the equation of evaporation rate.

   (ii) Find the relationship between the radius (r) of this naphthalene ball and time (t)

   D_{AB}:diffusivity; P:atmosphere pressure; T:temperature; P_A: vapor pressure of A

3. Consider the drying of a large polymer thin film having a uniform thickness of L (in the x-direction) which consists of a solvent. This solvent can be evaporated at ambient temperature. Transient diffusion of this solvent takes place in the solid polymer film when it starts to evaporate. Initial (t=0) solvent concentration in the polymer film is $C_{AO}=x$, and the atmosphere environment has a solvent concentration of C_{AS} (keeps constant). Find the transient concentration profile of the solvent in this polymer film. (Note) diffusivity is D_{AB} **(25%)**

4. At steady state, a small heated sphere having a radius of R_o (m) and heating rate per unit volume Q $(cal/m^3 \cdot s)$ which is suspended in a large stagnant medium at a temperature of T_o (^{o}K). Find the temperature profile (T) of this heated sphere as a function of radius (r). (Note) heat conductivity is k($cal/m \cdot {^o}K \cdot s$)   **(25%)**