

國立臺灣科技大學

114學年度碩士班招生

試題

系所組別：0600化學工程系碩士班

科目：工程數學與輸送現象

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(總分為 100 分；所有試題務必於答案卷內頁依序作答)

1. (20 points) Please solve the initial value problem.

$$y'' - 4y = -7e^{2x} + x$$

$$y(0) = 1, y'(0) = 3$$

2. (10 points) Please solve the initial value problem by Laplace transform.

$$y' - 4y = 1, y(0) = 1$$

3. (20 points) Please solve the problem

$$\frac{\partial^2 y}{\partial t^2} = 4 \frac{\partial^2 y}{\partial x^2} \quad \text{for } 0 < x < 5, t > 0$$

$$y(0, t) = y(5, t) = 0 \quad \text{For } t \geq 0$$

$$y(x, 0) = 0 \quad \frac{\partial y}{\partial t}(x, 0) = g(x) \quad 0 \leq x \leq 5$$

$$g(x) = \begin{cases} 0 & \text{for } 0 \leq x < 4 \\ 5-x & \text{for } 4 \leq x \leq 5 \end{cases}$$



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4. (15 points) Answer the following questions. If equations are written, please carefully indicate the meaning of each symbol you use.
- (a) (5 points) What's the driving force for heat transfer?
 - (b) (10 points) What's the assumption for a Langmuir isotherm?
5. (20 points) About the distillation process:
- (a) (10 points) What are the main components of a distillation tower? Please draw the system and point out each part of the tower. Also point out the rectifying and stripping section.
 - (b) (10 points) What is the definition of a q -line in the enthalpy related equation? Please indicate the condition of the feed stream if $q < 0$, $q = 0$, and $q > 1$. Please carefully indicate the meaning of each symbol you use.
6. (15 points) Answer the following questions. Please carefully indicate the meaning of each symbol you used.
- (a) (5 points) What is Nusselt number (Nu)? What's physical meaning of it?
 - (b) (5 points) What is Sherwood number (Sh)? What's physical meaning of it?
 - (c) (5 points) Sulfur dioxide gas is absorbed by liquid water, based on two film theory, which side of the mass transfer rate dominates the whole process and why?

