

國立臺灣科技大學 110 學年度碩士班招生試題

系所組別：機械工程系碩士班甲組、乙組、丙組、丁組

科目：工程數學

(總分為 100 分)

1. Solve the initial value problem : (25%)

(10%) (a)  $xy'' - y' = 2x^2$ ,  $y(0)=0$ ,  $y(1)=1$

(15%) (b)  $y'' + 5y' + 6y = e^{-2x}$ ,  $y(0)=0$ ,  $y(1)=e^{-3}$

2. Solve Laplace transform of function  $f(x)$ , where  $f(x) = \int_0^t e^{-\tau} \cos \tau d\tau$  (10%)

3. Solve the following integral equation: (15%)

$$f(t) + 2 \int_0^t f(\tau) \cos(t - \tau) d\tau = 4e^{-t} + \sin t$$

4.  $A = \begin{bmatrix} 0 & -2 \\ 1 & 3 \end{bmatrix}$  is diagonalizable. Evaluate  $e^A$ . (25%)

5. Solve the problem below: (25%)

$$\frac{\partial u(x,t)}{\partial t} = \frac{\partial^2 u(x,t)}{\partial x^2}, \quad -1 < x < 1, \quad 0 < t$$

$$u(-1,t) = 2, \quad u(1,t) = 4, \quad \text{and} \quad u(x,0) = 3 + x + \sin(2\pi x)$$

