淡江大學 95 學年度碩士班招生考試試題

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系別：機械與機電工程學系　　科目：工　程　數　學

准帶項目請打「V」	
	簡單型計算機

本試題共 4 頁

1. Solve the initial value problem (20%)

$$x^2y'' - 4xy' + 6y = x^4e^x; \quad y(2) = 2, \quad y'(2) = 7.$$

2. Solve the initial value problem (10%)

$$y''' + 4y'' + 5y' + 2y = 6\delta(t), \quad y(0) = y'(0) = y''(0) = 0 .$$

3. Find the solution of the system $\mathbf{AX} = \mathbf{B}$ (15%)

where $\mathbf{A} = \begin{bmatrix} 1 & -1 & 3 & -1 \\ 0 & 1 & -3 & 5 \\ 1 & 0 & -1 & 1 \\ 1 & 0 & 2 & -1 \end{bmatrix}$ and $\mathbf{B} = \begin{Bmatrix} 1 \\ 2 \\ 0 \\ -5 \end{Bmatrix}$.

4. Find the general solution of the system by diagonalization. (20%)

$$\begin{cases} x_1' = 3x_1 - x_2 + x_3 + 12e^{4t} \\ x_2' = x_1 + x_2 - x_3 + 4\cos(2t). \\ x_3' = x_1 - x_2 + x_3 + 4\cos(2t) \end{cases}$$

5. Find the Fourier series of the function on the interval (15%)

$f(x) = e^{-|x|}$ for $-\pi \le x \le \pi$.

6. Solve the partial differential equation (20%)

$$\frac{\partial^2 y}{\partial t^2} = 9\frac{\partial^2 y}{\partial x^2} \quad \text{for } 0 < x < 4, \quad t > 0,$$
$$y(0,t) = y(4,t) = 0 \quad \text{for } t > 0,$$
$$y(x,0) = 2\sin(\pi x), \quad \frac{\partial y}{\partial t}(x,0) = 0, \quad 0 \le x \le 4.$$