

## 淡江大學九十學年度碩士班招生考試試題

系別：機械工程學系

科目：工程數學

准帶項目請打「Q」否則打「X」	
計算機	字典
X	X

本試題共 1 頁

1. Find an integrating factor for the differential equation, the general solution, and then the solution of the initial value problem (15%)

$$y^3 - 2 + 2xy^2 y' = 0; \quad y(9) = 2.$$

2. Find the general solution (15%)

$$x^2 y'' - 2xy' + 2y = x^3 \cos x.$$

3. Solve the integral equation (15%)

$$f(t) = -1 + \int_0^t f(t-\alpha) e^{-3\alpha} d\alpha.$$

4. Solve the initial value problem of the system (20%)

$$\begin{cases} y_1' = 3y_1 + 3y_2 + 8 \\ y_2' = y_1 + 5y_2 + 4e^{3x} \end{cases}, \quad X(0) = \begin{Bmatrix} 2 \\ 3 \\ 14 \\ 3 \end{Bmatrix}.$$

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

$$f(x) = \begin{cases} 1-x, & -1 \leq x \leq 0 \\ 0, & 0 < x \leq 1 \end{cases}$$

6. Solve the partial differential equation (20%)

$$\begin{aligned} \nabla^2 u &= 0, & 0 < x < 2, & 0 < y < 2 \\ u(x, 0) &= u(x, 2) = 0, & 0 < x < 2 \\ u(0, y) &= 0, & 0 < y < 2 \\ u(2, y) &= \pi, & 0 < y < 2 \end{aligned}$$