

## 淡江大學九十二學年度碩士班招生考試試題

系別：電機工程學系

科目：工程數學

准帶項目請打「○」否則打「×」
簡單型計算機
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本試題共 1 頁

一.  $y''(t) + y(t) = f(t)$ ;  $y(0) = y'(0) = 0$ , where

$$f(t) = \begin{cases} 0 & \text{for } t < 1 \\ t & \text{for } t \geq 1 \end{cases}. \quad \text{Find } y(t). \quad (20\%)$$

二.  $y_1(x) = x$  for  $x > 0$  is a solution of the following differential equation  $x^3 y''(x) - 4x y'(x) + 4y(x) = 0$ . Please find a second nontrivial solution. (20%)

三. Given  $A = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \\ 4 & 5 & 6 & 7 \end{pmatrix}$ . (1) Find all the solutions  $\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix}$  of the equation  $A \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$ . (10%) (2) Compute the sum of all the eigenvalues of  $A$ . (5%) (3) Is it true that all the eigenvalues of  $A$  have positive real parts? (5%)

四. Evaluate  $\oint_C \frac{-y}{x^2+y^2} dx + \frac{x}{x^2+y^2} dy$ , where  $C$  is the simple, closed, positively oriented curve satisfying the equation  $x^2 + \frac{y^2}{4} = 1$ . (20%)

五. (1) Find the Fourier transform of  $f(t) = e^{-a|t|}$ ,  $t \in \mathbb{R}$ , where  $a > 0$ . (10%) (2) Find the inverse Fourier transform of  $\frac{12}{(1+w^2)(4+w^2)}$ . (10%)