



南台科技大學 100 學年度研究所考試入學招生考試

系組： 電機系、電機海外、生醫所、光電系

准考證號碼：

科目： 工程數學(146)

(請考生自行填寫)

注意事項	<p>一、請先檢查准考證號碼、報考系(組)別、考試科目名稱，確定無誤後再作答。</p> <p>二、所有答案應寫於答案紙上，否則不予計分。</p> <p>三、作答時應依試題題號，依序由上而下書寫，作答及未作答之題號均應抄寫。</p>
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1. Solve the given differential equation. $3x^2y'' + 6xy' + y = 0$ (10%)

2. Solve the given differential equation. $y'' + 2y' = 2x + 5 - e^{-2x}$ (15%)

3. Use the Laplace transform to solve the given integral equation.

$$f(t) = \cos t + \int_0^t e^{-\tau} f(t-\tau) d\tau \quad (10\%)$$

4. Use the Laplace transform to solve the given system of differential equation.

$$\begin{cases} \frac{dx}{dt} = 4x - 2y + 2\mu(t-1) \\ \frac{dy}{dt} = 3x - y + \mu(t-1) \\ X(0) = 0, y(0) = \frac{1}{2} \end{cases}, \quad \mu(t-1) = \begin{cases} 0, & 0 \leq t < 1 \\ 1, & t \geq 1 \end{cases} \quad (15\%)$$

5. Use the Gaussian elimination or Gauss-Jordan elimination to solve the given system.

$$\begin{cases} X_1 + 2X_2 + 2X_3 = 2 \\ X_1 + X_2 + X_3 = 0 \\ X_1 - 3X_2 - X_3 = 0 \end{cases} \quad (10\%)$$

6. If $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 1 & 0 & -1 \end{bmatrix}$ find (a) eigenvalues (b) eigenspace P (c) compute A^6 using the diagonal matrix D

by $A = PDP^{-1}$ (15%)

7. Four points $P_0(0,0,0), P_1(3,5,2), P_2(2,3,1), P_3(-1,-1,4)$ and $\vec{A} = P_0P_1, \vec{B} = P_0P_2, \vec{C} = P_0P_3,$

Find: (15%)

(a) $\vec{A} \times \vec{B} \times \vec{C}$

(b) $\vec{A} \cdot (\vec{B} \times \vec{C})$

(c) The plane contains P_1, P_2, P_3 points.

8. Find the Fourier series of $f(t) = |t| + \pi$ in the interval $-\pi < t < \pi$. (10%)