

朝陽科技大學 97 學年度碩士班招生考試試題

系 (所) 別：資訊工程系
 組 別：一般生乙組
 科 目：工程數學

總分：100 分

第 1 頁共 1 頁

1. (10%) Please solve $Ax = b$, where $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$ and $b = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$.

2. (15%) Use the Laplace transform to solve the following initial value problem.

$$y''(x) - y'(x) - 2y(x) = 0,$$

$$y(0) = 1, \quad y'(0) = 0.$$

3. (15%) Please solve the following initial value problem.

$$x' = \begin{bmatrix} -2 & 1 \\ -5 & 4 \end{bmatrix} x, \quad x(0) = \begin{bmatrix} 1 \\ 3 \end{bmatrix}.$$

4. Let $f(x) = \begin{cases} 0, & -2 < x < -1 \\ 1, & -1 < x < 1 \\ 0, & 1 < x < 2 \end{cases}$ and $f(x+4) = f(x)$ for all real x .

(a) (10%) Find the Fourier series representation of $f(x)$.

(b) (10%) Use (a) to find the sum of the series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{2n-1}$.

5. (10%) Suppose $x(t) = \begin{cases} 1, & |t| < \frac{1}{2} \\ 0, & \text{otherwise} \end{cases}$, and the Fourier transform of $x(t)$ is defined as $X(j\omega)$. Please

find $X(j\pi)$.

6. (15%) Please solve the following initial value problem.

$$x^3 y''' - 3x^2 y'' + 6xy' - 6y = 0,$$

$$y(1) = 2, \quad y'(1) = 1, \quad y''(1) = -4.$$

7. (15%) Let $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$, please compute e^{At} .