

國立虎尾科技大學九十七學年度研究所(碩士班)考試入學試題

所別：航空與電子科技研究所(甲、乙組)

科目：工程數學

注意事項：

(1) 本試題共五大題，每大題二十分，合計一百分。

(2) 答案卷上須註明題號並依序作答。

1. Solve the following differential equation (20%)

$$\frac{d^2 y}{dx^2} + y = 3 \sin x.$$

2. Solve the following initial value problem (20%)

$$\frac{d^2 y}{dt^2} - y = 0, \quad y(0) = 4, \quad y'(0) = -2.$$

3. Find the Laplace transform of $f(t) = t \sin(\omega t)$ where ω is a constant.

(20%)

4. Find the eigenvalues and the eigenvectors of the matrix (20%)

$$A = \begin{bmatrix} 7 & -1 & 6 \\ -10 & 4 & -12 \\ -2 & 1 & 1 \end{bmatrix}$$

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

$$f(x) = |x| \quad \text{for } -\pi < x < \pi \quad \text{and} \quad f(x+2\pi) = f(x) \quad \text{for all } x$$

(b) Show that (10%)

$$1 + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \cdots = \frac{\pi^2}{8}$$