

明新科技大學九十二學年度電子工程研究所招生

一般生工程數學試題

1. (a) Solve $y'' - 2y' + y = (x+1)e^x$. 10%
(b) Solve $y'' + y = 4\delta(t - 2\pi)$ subject to $y(0) = 1$, $y'(0) = 0$. 10%

2. (a) Given the matrix $\mathbf{A} = \begin{pmatrix} \sqrt{3}/2 & 1/2 \\ -1/2 & \sqrt{3}/2 \end{pmatrix}$, find \mathbf{A}^{10} . 10%

(b) Diagonalize the matrix

$$\mathbf{A} = \begin{pmatrix} 1 & 2 & 1 \\ 6 & -1 & 0 \\ -1 & -2 & -1 \end{pmatrix}. 10\%$$

3. Evaluate

(a) $\iint_R (y - 2x) dx dy$ where R is the rectangle $1 \leq x \leq 2$, $3 \leq y \leq 5$.

(b) $\int_0^{2\pi} |\cos x - \sin x| dx$

4. Solve the initial value problem by using Laplace transforms:

$$y'' - y' - 6y = \cos(2t); y(0) = y'(0) = 0.$$

5. Solve the boundary value problem:

$$\frac{\partial^2 y}{\partial t^2} = 4 \frac{\partial^2 y}{\partial x^2}, \quad (0 < x < 3, t > 0)$$

$$y(0, t) = y(3, t) = 0 \quad (t > 0)$$

$$y(x, 0) = 0, \quad \frac{\partial y}{\partial t}(x, 0) = x \quad (0 < x < 3)$$