國立聯合大學 108 學年度碩士班考試招生

電機工程學系 入學考試試題

科目：工程數學 第 1 頁共 1 頁

1. Solve the initial value problem of the following differential equations.

(1). $y'-2y=e^{-x}y^2, y(0)=4$ (10%)

(2). $xy\sin x dx+(\sin x-x\cos x+y^2)dy=0, y(0)=3$ (10%)

(3). $y''-4y'+4y=8e^{2x}, \quad y(0)=1, \quad y'(0)=4$ (10%)

(4). $x^2y''-3xy'+8y=0, \quad y(1)=1, \quad y'(1)=5$ (10%)

2. Find the solutions of the following differential equations using Laplace transforms.

(1). $y''+3y'+4y=\delta(t-2), \quad y(0)=1, \quad y'(0)=3$ (10%)

(2). $y(t)+2\int_0^t y(t-\tau)\sin(\tau)d\tau=e^{-t}$ (10%)

3. There is the linear transformation $Av=W$, where the matrix of the linear transformation is

$$A=\begin{bmatrix}4 & 0 & -2\\ 0 & 1 & 0\\ 1 & 0 & 1\end{bmatrix}.$$

(1). Find three eigenvalues of matrix of the linear transformation. (10%)

(2). Find three eigenvectors with respect to the eigenvalue of matrix of the linear transformation. (10%)

4. Calculate the following integral of the complex functions by using the residue theorem.

(1). $\oint_C(\frac{ze^{\pi z}}{z^2-4}+2ze^{\pi/z})dz$, counterclockwise around the circle $C: x^2+9y^2=9$. (10%)

(2). $\oint_C \frac{e^z\cos z}{(z-\pi/4)^3}dz$, counterclockwise around the circle $C: |z|=1$. (10%)