國立雲林科技大學
95 學年度碩士班入學招生考試試題

系所：電機系
科目：工程數學

1. Apply Laplace transform to solve the equation,

   $y''(t)+2ty'(t)-6y=t;\ \ y(0)=0, y'(0)=0$ (10%)

2. Find the inverse Laplace transform for the following function. (10%)

$$\frac{s}{(s+1)^2(s^2+2s+5)}$$

3. Apply Laplace transform to find the solution for the following equations. (10%)

$$x(t)+3\int_0^t[x(\tau)-y(\tau)]d\tau=1$$

$$y(t)+2\int_0^t[2y(\tau)-x(\tau)]d\tau=0$$

4. Find the Fourier transform for the following function. (10%)

$$\frac{3e^{it}}{t^2-2t+5}$$

5. Find the inverse Fourier transform for the following function. (10%)

$$\frac{1}{(1+\omega^2)(4+\omega^2)}$$

6. Find the general solution for the following differential equations.

   (i) $y^2+y-x\dfrac{dy}{dx}=0$ (10%)

   (ii) $\dfrac{d^2y}{dx^2}+2\dfrac{dy}{dx}-8y=16+(12x-4)e^{2x}$ (15%)

7. Determine the relationship of a, b, c such that the following system of linear equations has (i) an infinite number of solutions, (5%)

   (ii) exactly one solution, (5%)

   (iii) no solution. (5%)

$$\begin{aligned} 2x-y+z&=a \\ x+y+2z&=b \\ 3y+3z&=c \end{aligned}$$

8. Let $w=\begin{bmatrix}1\\2\\3\\-12\end{bmatrix}$, $v_1=\begin{bmatrix}1\\2\\3\\4\end{bmatrix}$, $v_2=\begin{bmatrix}-1\\-2\\-3\\4\end{bmatrix}$ and $v_3=\begin{bmatrix}0\\0\\1\\1\end{bmatrix}$. Write the vector w as a linear combination of vectors v_1, v_2 and v_3. (10%)