國立雲林科技大學
96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

共9題，合計100分，請依序作答，否則不計分

1. Find the general solution of the differential equation (10 分)

$$\frac{dy}{dx}=-\frac{3xy+y^2}{x^2+xy}$$ *[Hint: Exact Form- using integrating factor $\phi(x)=x$]*

2. Find the general solution of the differential equation: $y''-2y'-8y=6e^{-2x}$ (15 分)

3. The nonhomogeneous system of linear equations $AX=B$, in which $A=\begin{bmatrix}-1 & 1 & 3\\ 0 & 1 & 2\end{bmatrix}$ and $B=\begin{bmatrix}-2\\ 4\end{bmatrix}$. Find (1) the reduced row echelon form of augmented matrix $[A\,|\,B]$, (2) the dependent unknowns and independent unknowns, and (3) the general solution of $AX=B$。(15 分)

4. Let $A=\begin{bmatrix}0 & -2\\ 1 & 3\end{bmatrix}$, find (1) the eigenvalues and eigenvectors of A, and (2) the matrix A^{10}。(10 分)

5. Apply Laplace transform to solve the equation,
$$y''(t)+4y'(t)+4y=3H(t-2);y(0)=0,y'(0)=0,$$
where H(t) is Heaviside function. (10%)

6. Find the inverse Laplace transform for the following function. (10%)
$$\frac{3e^{-2s}}{(s+1)^2(s^2+2s+10)}$$

7. Apply Laplace transform to find the solution for the following equations. (10%)
$$x''(t)-2x'(t)+3y'(t)+2y(t)=3.$$
$$.....2y'(t)-x'(t)+3y(t)=0,$$
$$.....x(0)=x'(0)=y(0)=0.$$

8. Find the Fourier transform for the following function (10%)
$$f(t)=t[H(t+2)-H(t-2)],$$
where H(t) is Heaviside function.

9.. Find the inverse Fourier transform for the following function (10%)
$$\frac{5e^{j4\omega}\cos(2\omega)}{(9+\omega^2)(4+\omega^2)}$$