# 國立嘉義大學 99 學年度

# 生物機電工程學系碩士班招生考試試題

**科目：工程數學**　　（※禁止使用計算機）

1. Following equation is a linear nonhomogeneous equation.

$$y''+2y'-3y=2x;\quad y(0)=3,\quad y'(0)=3.$$

(a) Solve the differential equation using the method of undetermined coefficients. (15%)

(b) Solve the differential equation using Laplace transform. (10%)

2. Consider the matrix $\mathbf{A}=\begin{bmatrix} 0 & 2 & 0 \\ 3 & 0 & -2 \\ -2 & 0 & 0 \end{bmatrix}$.

(a) Find the eigenvalues and eigenvectors of A. (15%)

(b) Is A diagonalizable? (10%)

3. Given a differential equation $x^2y''-3xy'+4y=0.$

(a) Verify that $y_1 = x^2$ is a particular solution. (10%)

(b) Find $y_2 = ?$ by the method of the reduction of order. (15%)

4. Solve the wave equation for a string: (25%)

PDE: $\dfrac{\partial^2 u}{\partial x^2}=\dfrac{\partial^2 u}{\partial t^2}$, $0<x<1$, $t>0$.

BC: $u(0,t)=0$, $u(1,t)=0$, $t>0$.

IC: $u(x,0)=0$, $\left.\dfrac{\partial u}{\partial t}\right|_{t=0}=\sin(\pi x)$, $0<x<1$.