國立高雄應用科技大學
104 學年度研究所碩士班招生考試
機械工程系碩士班
工程數學(乙組)

注意：a. 本試題共 5 題，每題 20 分，共 100 分。
　　　b. 作答時不必抄題。
　　　c. 考生作答前請詳閱答案卷之考生注意事項。

1. Solve the given differential equation.

$$y''+2y'+2y = \cos 2x$$

2. Solve the given differential equation using power series method.

$$y''-y = 0$$

Hint: $\displaystyle y = \sum_{m=0}^{\infty} a_m x^m = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + a_4 x^4 + \cdots$

$\displaystyle e^x = \sum_{m=0}^{\infty} \frac{x^m}{m!} = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \cdots$

3. Solve the given initial value problem using Laplace Transform.

$$y''+3y'+2y = 1, \quad y(0) = 1, \quad y'(0) = 1$$

4. Find the eigenvalues, eigenvectors, and inverse of the given matrix A.

$$A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

5. Write down the definitions of divergence (div) and curl. Find the div and curl of the given vector function.

$$\vec{v} = (z-y)\vec{i} + (x-z)\vec{j} + (y-x)\vec{k}$$