明志科技大學 100 學年度研究所碩士班一般考試暨在職專班招生命題用紙

所別： ___電子工程研究所___ 組別： ___***___ 科目： ___工程數學___
注意：■不准□一般□工程用計算器，考試時間總計：100 分鐘。試題共 1 頁，第 1 頁

1. Solve the initial problem of the differential equation. (15%)

$$y' = y\frac{(x-1)^2}{y^2+3}; \, y(2) = -1.$$

2. Solve the differential equation. (15%)

$$y''-4y'+4y = 6e^{2x}$$

3. In the following problem, use the linearity of the Laplace transform to find the inverse Laplace transform of the function. (20%)

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

4. Find an orthogonal matrix that diagonalizes the matrix and compute the indicated power of matrix. (20%)

$$\mathbf{A} = \begin{pmatrix} 4 & -2 \\ -2 & 1 \end{pmatrix}; \, \mathbf{A}^{50}.$$

5. Let

$$f(t) = \begin{cases} |t| & \text{for} -1 \le t \le 1 \\ 0 & \text{for } t > 1 \text{ and for } t < -1 \end{cases}.$$

Find the Fourier transform of the function. (20%)

6. In the following problem, evaluate $\oint_C \mathbf{F} \cdot d\mathbf{R}$. $\mathbf{R}$ is position vector and the symbol $\oint_C$ means a line integral is taken around a closed curve. The curve is oriented counterclockwise. (Hint: Green's theorem) (10%)

$$\mathbf{F} = 6xy^2\mathbf{j}, \, C \text{ is the circle of radius 3 about the origin.}$$