國立彰化師範大學 100 學年度碩士班招生考試試題

系所：工業教育與技術學系　　組別：乙組　　科目：工程數學

☆☆請在答案紙上作答☆☆　　

共佔 100 分每題配分置於題目後面

1. Find the Determine of the following matrix. (10%)

$$\begin{bmatrix} 1 & -1 & 2 & 3 \\ 2 & 2 & 0 & 2 \\ 4 & 1 & -1 & -1 \\ 1 & 2 & 3 & 0 \end{bmatrix}$$

2. Given $\mathbf{A}=\begin{bmatrix} 0 & -2 \\ 1 & 3 \end{bmatrix}$ Find $\sin(\mathbf{A})$. (15%)

3. Given $y'' + y = \sec x$, Find y: (10%)

4. Solve the initial value problem (10%)

$$y'' - 4y' + 4y = \delta(t-1) - \delta(t-2), \quad y(0) = 0 \quad y'(0) = 0$$

5. $\dfrac{\partial u}{\partial t} = k\dfrac{\partial^2 u}{\partial x^2} - \beta u$, where β is a constant. (15%)

$u_x(0,\ t) = u_x(\ell,\ t) = 0,\ u\ (x,\ 0) = 1$. Find u:

6. Evaluate (counterclockwise) (10%)

(a) $\displaystyle\int_{-\infty}^{\infty} \frac{dy}{(y^2+4)^2}$

(b) $\displaystyle\int_0^{2\pi} \frac{\cos x}{13-12\cos 2x} dx$

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7.Find a general solution (15%)

$$\begin{cases} x_1' = 4x_1 + 3x_2 + 2 \\ x_2' = -6x_1 - 5x_2 + 4e^{-t} \end{cases}$$

8. Given the function $f(x) = \begin{cases} 0, & -\pi < x < 0 \\ \sin x, & 0 \le x < \pi \end{cases}$ (15%)

(a) Find its Fourier series (10%)

(b) Show that $\frac{1}{2} + \frac{1}{1\times 3} - \frac{1}{3\times 5} + \frac{1}{5\times 7} - \frac{1}{7\times 9} + \ldots = \frac{\pi}{4}$ (5%)