國立彰化師範大學 100 學年度碩士班招生考試試題

系所：車輛科技研究所　　科目：工程數學

☆☆請在答案紙上作答☆☆　　共 1 頁，第 1 頁

共佔 100 分每題配分置於題目後面

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

$$\begin{bmatrix} 2 & 0 & -4 & 6 \\ 4 & 5 & 1 & 0 \\ 0 & 2 & 6 & -1 \\ -3 & 8 & 9 & 1 \end{bmatrix}$$

2. Given $\mathbf{A}=\begin{bmatrix} 4 & 1 \\ 1 & 4 \end{bmatrix}$，Find $e^{\mathbf{A}}$. (15%)

3. Given $y''+0.2y'+0.26y=1.22e^{0.5x}$, $y(0)=3.5,\quad y'(0)=0.35$, Find y: (10%)

4. Solve the initial value problem (10%)

$$y''-y=10\delta(t-\frac{1}{2})-100\delta(t-1),\quad y(0)=10,\quad y'(0)=1$$

5. $\frac{\partial u}{\partial t}=k\frac{\partial^2 u}{\partial x^2}-\beta u$, where β is a constant. (15%)
$u_x(0,\quad t)=u_x(\ell,\quad t)=0,\quad u\ (x,\quad 0)=1$. Find u:

6. Evaluate (counterclockwise) (10%)

(a) $\oint_c \frac{30z^2-23z+5}{(2z-1)^2(3z-1)}dz,\quad C:|z|=1$

(b) $\int_{-\infty}^{\infty}\frac{1}{x^2+4}dx$

7.Solve the given initial value problem (15%)

$$\begin{cases} y_1'=-y_1+y_2 \\ y_2'=-y_1-y_2 \end{cases},\quad y_1(0)=1,\quad y_2(0)=0$$

8.Given the function $f(x)=\frac{x^2}{2},\quad -\pi<x<\pi$ (15%)

(a) Find its Fourier series (10%)

(b) Show that $1+\frac{1}{4}+\frac{1}{9}+\frac{1}{16}+\ldots=\frac{\pi^2}{6}$ (5%)