國立彰化師範大學106學年度碩士班招生考試試題

系所：物理學系(甲組選考甲)　　科目：工程數學

☆☆請在答案紙上作答☆☆　　

1. Solve the given equation $y''-3y'+2y=e^{x}$, $y(0)=0$, $y(1)=1$. (12%)

2. Find the Fourier series of the following periodic function

$$f(x)=\begin{cases}x^{2} & 0\le x<1\\ 1 & 1\le x<4\end{cases}.$$ (18%)

3. Solve the eigenvalues and eigenvectors of the matrix $\mathrm{A}=\begin{bmatrix}-2 & 2 & -3\\ 2 & 1 & -6\\ -1 & -2 & 0\end{bmatrix}$. (20%)

4. Compute the value of the following complex line integral $\int_{|z|=4}\frac{z^{3}+z+1}{z^{3}-6z^{2}+5z}dz$. (16%)

5. Solve the heat equation $\frac{\partial u}{\partial t}=\beta\frac{\partial^{2}u}{\partial x^{2}};\ 0<x<1,\ t>0$ subject to the conditions:
$u(0,t)=0,\ u(1,t)=0$, and $u(x,0)=2\sin(\pi x)+\sin(4\pi x)$. Here β is a constant. (16%)

6. Use Laplace transforms to solve the initial value problem
$y''+y=4H(t-\pi)$, $y(0)=2,\ y'(0)=4$. Here $H(t)$ is the Heaviside function, which takes the value 1 for $t\ge 0$ and 0 for $t<0$. (18%)