國立成功大學
113學年度碩士班招生考試試題

編　號：142

系　所：環境工程學系

科　目：工程數學

日　期：0201

節　次：第 3 節

備　註：不可使用計算機

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Please find the eigenvalues and eigenfunctions for the following boundary-value problems. (5 points for each)

　A. $y''+\lambda y=0,$　$y(0)=0,\ y(3)=0.$　　　　　B. $y''+\lambda y=0,$　$y(0)=0,\ y'(\pi)=0.$

2. Find general solution of the system:　(5 points)

$$\frac{dx}{dt}=2x-7y$$
$$\frac{dy}{dt}=5x+10y+4z$$
$$\frac{dz}{dt}=5y+2z$$

3. Find general solution for the equation:　$y''+4y'+13y=0$　　(10 points)

4. Solve the following differential equation: $y''-3y'+2y=10\sin(x)$　　(10 points)

5. Solve the differential equation $\frac{dy}{dx}=\frac{4x+6y}{10y-6x}$　　(10 points)

6. Solve the initial-value problem $y''+7y'=0,\ y(0)=1, y'(0)=7.$　(10 points)

7. Find the Fourier series of

$$f(x)=\begin{cases}0 & -\pi<x<0 \\ 3 & 0\le x<\pi\end{cases}$$

　　(15 points)

8. For the Laplace's equation $\dfrac{\partial^2 u}{\partial x^2}+\dfrac{\partial^2 u}{\partial y^2}=0,$　find $u(x,y)$ if

A. $\begin{cases} 0<y<1,\ 0<x<1. \\ \left.\frac{\partial u}{\partial x}\right|_{x=0}=0, \left.\frac{\partial u}{\partial x}\right|_{x=1}=0, \\ u(x,0)=0,\quad u(x,1)=5 \end{cases}$

B. $\begin{cases} u(0,y)=0,\quad 0<y<2 \\ u(x,0)=\begin{cases}1, & |x|<1 \\ 0, & |x|>1\end{cases}, \quad u(x,2)=0,\quad x>0 \end{cases}$

(15 points for each one)