大葉大學九十學年度研究所碩士班招生考試試題紙			
系 所 組 別	考 試 科 目 （中 文 名 稱）	考 試 日 期	備 註
電機工程研究所 甲乙丙丁戊組	工程數學	4 月 22 日 第 1 節 8:30~10:00	

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）

一、Solve the following first order differential eqs.

$$\begin{cases} x' = 5x + 4y - 5t^2 + 6t + 25 \quad , \quad x(0) = 0 \\ y' = x + 2y - t^2 + 2t + 4 \quad , \quad y(0) = 0 \end{cases}$$

, find $y(t)$ and $x(t)$.

where $x' = \frac{dx}{dt}$, $y' = \frac{dy}{dt}$ (15%)

二、Solve the following second order differential eqs.

（a）. $y'' - 3y' + 2y = 4t - 6$, $y(0) = 1$, $y'(0) = 3$, find $y(t)$

where $y' = \frac{dy}{dt}$, $y'' = \frac{d^2y}{dt^2}$ (10%)

（b）. $y'' - 4y' + 4y = 6 + \frac{e^{2x}}{x}$, $y(1) = 0$, $y'(1) = e^2 - 3$, find $y(x)$

where $y' = \frac{dy}{dx}$, $y'' = \frac{d^2y}{dx^2}$ (15%)

三、Consider the sawtooth function $f(x) = \begin{cases} x+1 & , \ -1 \le x \le 0 \\ -x+1 & , \ 0 \le x \le 1 \end{cases}$, $f(x+2) = f(x)$

find its Fourier Series . (15%)

四、A particle moves counter clockwise(c.c.w) around the rectangle having vertices (0，0) ,(6，0), (0，4), (6，4) under the influence of the force $\vec{F} = x^2 i + 2xyj$, calculate the work done by $\vec{F}$ after one complete circuit , i.e. find $\int_c \vec{F} \bullet d\vec{r}$ (15%)

五、Given matrix A= $\begin{bmatrix} 0 & 2 & 0 \\ 3 & -2 & 3 \\ 0 & 3 & 0 \end{bmatrix}$

(a). find its eigenvalues (5%)

(b). find its corresponding eigenvectors (5%)

六、Find the following complex integration

(a). $\int_0^{2\pi} \frac{\cos\theta}{1+\frac{1}{4}\cos\theta} d\theta$, where integration path $c:|z|=1$, $z=x+iy$ (10%)

(b). $\int_c \frac{\cos z}{z^3+z} dz$, where $c:(a)\ |z|=2$ (b) $|z|=\frac{1}{2}$ (c) $\left|z-\frac{i}{2}\right|=1$

where $z=x+iy$ (10%)