國立台灣科技大學九十七學年度碩士班招生試題

系所組別： 自動化及控制研究所碩士班甲組、乙組

科　　目： 工程數學

總分為100分，題號請標示清楚。

1. Solve the following differential equations:

(1) $yy'+2t+y^2=0;\quad y(0)=2$ **(10%)**

(2) $y''-y=5\sin^2(t);\quad y(0)=2, y'(0)=-4$ **(10%)**

2. Solve $x(t)$ and $y(t)$ from the simultaneous differential equations. **(15%)**

$x'-x+y=e^{-t}$

$y'-2x+2y=e^{-t}\sin(2t)$

3. Solve the following equation by using Laplace Transform method. **(15%)**

$y'+3y+2\int_0^t ydt=H(t-2)$

where $y(0)=1$ and $H(t)=\begin{cases}0 & t<0\\ 1 & t\geq 0\end{cases}$

4. Determine eigenvalues and eigenvectors of **A** (20%)

$$\mathbf{A}=\begin{bmatrix}-2 & 2 & -3\\ 2 & 1 & -6\\ -1 & -2 & 0\end{bmatrix}$$

5. Find $\int_0^{2\pi}\frac{d\theta}{3-2\cos\theta+\sin\theta}$ (10 %)

6. Solve the P.D.E. $\frac{\partial^2\phi}{\partial x^2}+\frac{\partial^2\phi}{\partial y^2}=0$ with the following boundary conditions:

$\phi(0,y)=0$

$\phi(h,y)=0$

$\phi(x,0)=g(x)$ (20%)

$\phi(x,l)=0$