# 朝陽科技大學 97 學年度碩士班招生考試試題

系（所）別：資訊與通訊系
組　　別：一般生乙組
科　　目：工程數學

總分：100 分



1. Find the general solution of the following equation.
   (a) $y'-3y=6$ (5%)
   (b) $y''+3y'+2y=2x+e^{3x}$ (10%)

2. If $\mathbf{A}=\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix},\mathbf{B}=\begin{bmatrix}1 & -1\\ 2 & 3\end{bmatrix},\mathbf{C}=\begin{bmatrix}1 & 4\\ -2 & 3\end{bmatrix}$, find that:
   (a) $\mathbf{A(BC)}$ (b) $\mathbf{AB}^T$ (c) $\mathbf{A}^{-1}\mathbf{C}$ (15%)

3. Show that the given functions are orthogonal on the indicated interval:
   (a) $f_1(x)=\sin 2x,\ f_2(x)=\cos 2x,\ \left[-\frac{\pi}{2},\ \frac{\pi}{2}\right]$ (5%)
   (b) $f_1(x)=\cos x,\ f_2(x)=\cos 2x,\ [-\pi,\ \pi]$ (5%)

4. Use Cramer's rule to solve the system of equations:
   $x+y+z=0$
   $2x+6y+3z=1$ (10%)
   $-x+2y+2z=3$

5. The following functions, $f(x)$, are assumed to be periodic, of period $2\pi$. Are they even or odd?
   (a) $f(x)=x|x|$ $(-\pi<x<\pi)$ (5%)
   (b) $f(x)=|\sin x|$ $(-\pi<x<\pi)$ (5%)

6. Write the Laplace transforms of the following functions. ($w$ is a constant.)
   (a) $f(t)=1$ (3%)
   (b) $f(t)=t$ (3%)
   (c) $f(t)=t^2$ (3%)
   (d) $f(t)=\cos wt$ (3%)
   (e) $f(t)=\sin wt$ (3%)

7. Let $f(t)=\sin^2 t$. Find $L(f)$ by $L(f')=sL(f)-f(0)$, where $L(f)$ is denoted the Laplace transform of $f(t)$. (10%)

8. Find the Fourier series of the periodic function $f(x)$. The formula of $f(x)$ is
   $f(x)=\begin{cases}-k & \text{if} \quad -\pi<x<0\\ k & \text{if} \quad 0<x<\pi\end{cases}$ and $f(x+2\pi)=f(x)$. (15%)