國立臺灣科技大學
九十四學年度碩士班招生考試試題
系所組別：電機工程系碩士班甲組、電機工程系碩士班乙二組
科　　目：工程數學

題目共 2 頁， 8 題，總分 100 分，各題分數如示。

(1) Find the general solution for the following equation:
$y^{(7)}+18y^{(5)}+81y'''=0$ (15%)

(2) Find the Fourier transform for the following function:

$h(t)=\int_{-\infty}^{t} g(x)dx$ (10%)

(3) Let $u(t)$ denote the unit step function, find the Laplace transform for the following function:

$$f(x)=\sin\left[3\left(4t-\frac{\pi}{6}\right)\right]u(4t-6\pi) \quad (10\%)$$

(4) Consider the symmetric matrix $A=\begin{bmatrix} 5 & -4 & -2 \\ -4 & 5 & -2 \\ -3 & -2 & 8 \end{bmatrix}$, find its orthogonal diagonalizing matrix Q. (15%)

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5. Calculate the complex variable integral $\oint_C \frac{\sin 2z}{(z+3)(z+2)^2}dz$, where C is a clockwise rectangular contour with vertices at 3+i, -2.5+i, -2.5-i, 3-i. (10%)

6. Solve the complex quadratic equation $z^2-(4+i)z+(8+i)=0$. (10%)

7. Verify the Stokes's theorem by the vector function $\vec{F}=y\vec{i}+z\vec{j}+x\vec{k}$, where $\vec{i}$, $\vec{j}$, and $\vec{k}$ are the mutual orthogonal unit vectors in the x-y-z coordinate system, by the unit circle $x^2+y^2=1$ in the x-y plane. (15%)

8. Let $f(x,y,z)=2x+yz-3y^2$ and $\vec{F}$ is the gradient of f. Calculate the line integral $\int_C \vec{F}\cdot d\vec{\ell}$, where C is the quarter circle from A to B as show in Figure P8. (15%)

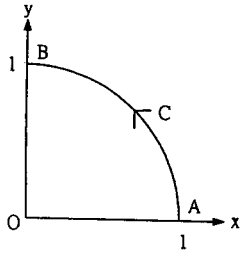

Figure P8

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