

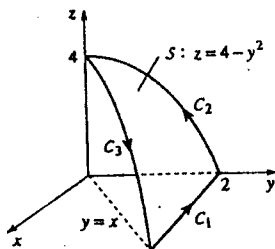
國立臺灣科技大學

九十二學年度碩士班招生考試試題

系所組別：電子工程系碩士班乙一組、乙二組、乙三組、丙組
科目：工程數學

總分 100 分

- (1) Solve $ty'' + (4t-2)y' - 4y = 0$ $y(0) = 1$. Furthermore if $y(0)$ is not known. Solve the differential equation again. (12%)
- (2) Let $f(x)$ be integrable in $[-L, L]$. If $f(x)$ can be approximately represented as $a_0 + \sum_{n=1}^{\infty} a_n \cos\left(\frac{3n\pi x}{L}\right) + b_n \sin\left(\frac{5n\pi x}{L}\right)$ find the coefficients a_0 , a_n and b_n . (10%)
- (3) Assume that A , τ and f_c are constants $f_c = 10M$, a signal $f(t) = A\tau \frac{\sin^2 \pi t \tau}{t^2 \tau^2} \cos 2\pi f_c t$, find the energy of the signal. (8%)
- (4) A vector field $\vec{V} = xz \hat{j}$ and a surface $z = 4 - y^2$ cut off by the planes $x = 0, z = 0$ and $y = x$ as shown in figure below. If $c = c_1 + c_2 + c_3$
- (1) find $\oint_c \vec{V} \cdot d\vec{R}$ by Line integral. (8%)
- (2) Solve (1) again by applying the Stokes's Theorem. (12%)



5. Determine whether the following set of vectors is a subspace of \mathbf{R}^n for the appropriate n .
- (a) S consists of all vectors $(2x, 0, 0, 0, 0, 3y)$ in \mathbf{R}^6 . (10pts)
- (b) S consists of all vectors $(x, 1, y)$ in \mathbf{R}^3 . (10pts)
6. Find a fundamental matrix for the system $\dot{X} = AX$ with A the giving matrix. (10pts)
- $$\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$$
7. Find $\oint_{\Gamma} f(z) dz$, where $f(z) = z^2 / (z+1)^2 (z+3i)$ and Γ is the circle of radius 9 about $-2i$. (10pts)
8. Show that $u = \sin x \cdot \cosh y$ satisfies the Laplace equation. (10pts)

