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： 電機工程系碩士班己組

科　　目： 工程數學

總分 100 分

(1) Find a unit normal vector **n** on the plane $4x^2 + y^2 = z$ at the point $(1, -2, 8)$. (16%)

(2) Evaluate the integral $\oint_C \frac{1}{z^2(z-2i)}dz$ where C is (a) $|z-1|=1$, (b) $|z-1|=2$, (c) $|z-1|=3$. (18%)

(3) Find the probability of P($x>V$) for a Rayleigh distribution $p(x) = \frac{x}{\psi} e^{-x^2/2\psi}, x \geq 0$. (16%)

(4) Given $A = \begin{pmatrix} 2 & 1 & 0 & -5 \\ -1 & 0 & 1 & 2 \end{pmatrix}$

(a) Find a basis for the nullspace of A. (8%)

(b) Given that $\{(2,1,0,-5)^T, (-1,2,5,0)^T\}$ is an orthogonal basis for the column space of A^T, find the vector in the column space of A^T that is closest to $(-1,0,0,1)^T$. (12%)

(5) Find the inverse Laplace transform of $Y(s) = \frac{2}{s^3(s+2)^2}$. (15%)

(6) Given the Fourier transform pair: $x(t) \leftrightarrow X(\omega)$, derive the Fourier transform of $x(at)$. Also find $X(\omega)$ when $x(t) = e^{-c|t|}$ where $c > 0$. (15%)