國立彰化師範大學 101 學年度碩士班招生考試試題

系所： 電機工程學系　　科目： 工程數學

☆☆請在答案卷上作答☆☆　　

1. Solve the following differential equations. (20%)

(1) $y' = \dfrac{2x-3y}{3x-2y}$

(2) $x^2y'' - 3xy' + 3y = 0$

2. Use Laplace transform to solve the equation： (10%)

$$y(t) = e^{-t} + 2\int_0^t e^{-3\tau} y(t-\tau)d\tau$$

3. Find Laplace transform of $h(t) = t^2 + \cos 2t$. (10%)

4. Find the Fourier series of a periodic function defined as $f(t) = t,\ -1 \le t \le 1,\ f(t) = f(t+2)$. (10%)

5. Evaluate the surface integral $\oiint_S 4xdydz - zdxdy$ over the sphere $S: x^2 + y^2 + z^2 = 4$. (10%)

(Hint: $\oiint_S \vec{F} \cdot d\vec{s} = \iiint_V \nabla \cdot \vec{F}\, dv$)

6. $A = \begin{bmatrix} k_1 & k_3 & k_2 \\ k_3 & k_2 & k_1 \\ k_2 & k_1 & k_3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$, if $AB = 3B$, find (1) k_1, k_2, k_3 (2) det A. (20%)

7. Evaluate the following integrals in a complex plane for the circle of C: $|z| = 4$. (20%)

(1) $\oint_C \dfrac{1}{z} dz$

(2) $\oint_C \dfrac{\cos z}{z-\pi} dz$

(3) $\oint_C \dfrac{z}{z^2 - 5z - 6} dz$

(4) $\oint_C \dfrac{e^{2z}}{z^3} dz$