

國立彰化師範大學 100 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

☆☆請在答案紙上作答☆☆

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1. (35%) Solve the following differential equations

(a) $(x^2 + 4xy)dx + (2x^2 + y)dy = 0$. (10%)

(b) $y'' - 2y' - 3y = 0$, $y(0) = 0$, $y'(0) = 8$. (10%)

(c) $y'' - 4y' + 4y = \sin x$. (15%)

2. (25%) Find the answers for the following Laplace operations

(a) $L[t^2 - 4e^{-t}]$. (5%)

(b) $L^{-1}\left[\frac{s+2}{s^2+4}\right]$. (10%)

(c) $L^{-1}\left[\frac{s+2}{s^2(s-1)^2}\right]$. (10%)

3. (20%) $A = \begin{bmatrix} 2 & -1 & -3 \\ 4 & 2 & 1 \\ -3 & 2 & 4 \end{bmatrix}$, find

(a) AA . (5%)

(b) $\det A$. (5%)

(c) A^{-1} . (10%)

4. (10%) $f(t)$ is a periodic function and in one period it can be expressed by $f(t) = \begin{cases} 0, & -3 \leq t < 0 \\ 1, & 0 \leq t < 3 \end{cases}$.

Find the Fourier series of $f(t)$.

5. (10%) Evaluate the line integrals $\oint_C \frac{z^2 + 1}{z(z-1)(z-3)} dz$, $C: |z| = 2$ in a complex plane.