

元智大學 102 學年度研究所 碩士班 招生試題卷

系(所)別：光電工程學系碩士班

組別：不分組

科目：工程數學

用紙第 / 頁共 / 頁

●不可使用電子計算機

1. Please solve the following ordinary differential equations.

(a) $y' + xy = xy^{-1}, y(0) = 3$ (10%)

(b) $y'' + 2y' + 5y = 25t - 10\delta(t - \pi), y(0) = -2, y'(0) = 5$ (15%)

(c) $y''' - 3y'' + 3y' - y = e^x - x - 1$ (10%)

2. Integrate counterclockwise around the circle: $|z - 3| = 2$ (10%)

$$\oint_C \frac{5z+9}{z^3-9z} dz$$

3. Find an eigenbasis and diagonalize. (Please show the details.) (10%)

$$\begin{bmatrix} 5 & 3 \\ 1 & 3 \end{bmatrix}$$

4. Evaluate the surface integral $\iint_S (\nabla \times \vec{F}) \cdot \vec{n} dA$ directly for the given F and S .

$$\vec{F} = [e^y, e^z, e^x], S: z = x^2, 0 \leq x \leq 2, 0 \leq y \leq 2$$
 (15%)

5. Please use the Fourier cosine integral of $f(x)$ to calculate the Fourier cosine transform. (Please show the details) (15%)

$$f(x) = \begin{cases} e^{-2x}, & (x > 0) \\ 0, & (x < 0) \end{cases}$$

6. Find the transient solution and the steady-state solution of the initial value problem for the RLC-circuit with the given data. (15%)

$$R = 8\Omega, L = 0.5H, C = 0.1F, E(t) = 100 \sin 2t \text{ (V)}$$

