

甲 (分子生醫光電) 組

95 學年度生醫工程與環境科學系 (所) 丙 (醫學暨保健物理) 組碩士班入學考試

3003、

科目 應用數學 科目代碼 3203 共 2 頁第 1 頁 *請在【答案卷卡】內作答

1. (10 Points) Find the Fourier series of the following periodic function

$$f(x) = \begin{cases} \sin 2x & -\pi < x < -\pi/2 \\ 0 & -\pi/2 \leq x \leq 0 \\ \sin 2x & 0 < x \leq \pi \end{cases}$$

2. (10 Points) Find the general solution of the differential equation $\frac{dy}{dx} - 2y = xy^{1/2}$.

3. (10 Points) Find the contour integral $\oint_C \frac{2z-3}{z^3-3z^2+4} dz$ with contour (a) $|z|=3/2$, and (b)

$$|z-3|=2.$$

- (10 Points) (a) Reduce the following matrix to its echelon and row-reduced echelon form

$$\begin{bmatrix} 0 & 1 & 2 & 0 & 3 \\ 2 & 4 & 8 & 2 & 4 \\ 1 & 2 & 4 & 2 & 2 \\ 1 & 3 & 6 & 1 & 5 \end{bmatrix}$$

- (b) Solve the system of linear equations

$$x_2 + 2x_3 = 3$$

$$2x_1 + 4x_2 + 8x_3 + 2x_4 = 4$$

$$x_1 + 2x_2 + 4x_3 + 2x_4 = 2$$

$$x_1 + 3x_2 + 6x_3 + x_4 = 5$$

5. (10 Points) Solve the initial value problem $\cos x \frac{dy}{dx} + y = \sin x$, $y(0) = 2$.

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6. (10 Points) Find the general solution of the differential equation

$$x^2 \frac{d^2 y}{dx^2} + 3x \frac{dy}{dx} + 2y = 0, \quad x \neq 0.$$

7. (10 Points) Find the general solution of the differential equation

$$x^2 \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} + 4y = \ln x, \quad x > 0.$$

8. (10 Points) Find the general solution of the differential equation

$$\frac{d^2 y}{dx^2} + 5 \frac{dy}{dx} + 6y = 4e^{-x} + 5 \sin x.$$

9. (10 Points) Find (a) Laplace transform of $L\{t^3 - 4t + 5 + 3 \sin 2t\}$, (b) inverse Laplace

transform $L^{-1} \left\{ \frac{s^4 + 5s^2 + 2}{s^3(s^2 + 1)} \right\}$

10. (10 Points) Find eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} 2 & 1 & -1 \\ 3 & 2 & -3 \\ 3 & 1 & -2 \end{bmatrix}$.