

# 大葉大學九十一學年度轉學招生考試試題紙

系 別	日\ 第二部	年級	考 試 科 目 ( 中 文 名 稱 )	考試日期	節次	備註
機械工程學系	日間部 第二部	三	工程數學	7月23日	三	

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）

1.

a. Solve the boundary value problem

$$y'' + \lambda y = 0, \quad y(-\pi) = y(\pi), \quad y'(-\pi) = y'(\pi). \quad (10\%)$$

b. For the initial value problem

$$y'' - 6y' + 9y = 10e^{3x}, \quad y(0) = 2, \quad y'(0) = 1,$$

solve its homogeneous solution and its particular solution. (15%)

2.

a. Find the series solution of the differential equation

$$y'' + xy' - y = 0. \quad (10\%)$$

b. Solve the nonhomogeneous differential equation by series method

$$y'' + xy' - y = 1 + x^2. \quad (10\%)$$

3.

a. Find the Fourier series for the following function

$$f(x) = \begin{cases} 0, & \text{for } -\pi \leq x < 1 \\ 1, & \text{for } 1 \leq x < 2 \\ 3, & \text{for } 2 \leq x < \pi \end{cases} \quad (15\%)$$

b. What values will the Fourier series of  $f(x)$  converge to at the points

$$x = -\pi, 1, 2, \pi? \quad (5\%)$$

4.

a. Explain the Cauchy Integral Theorem for the complex function theory. (5%)

b. Use Cauchy Integral Theorem to evaluate the integral  $\int_C f(z)dz$ , where the

integrand is  $f(z) = \frac{2z+1}{z^3 - iz + 6z}$ , and the integral path  $C: |z - 3i| = \frac{1}{3}$

counterclockwise. (10%)

5. Solve the system of linear equations

$$\mathbf{AX} = \mathbf{B},$$

in which

$$\mathbf{A} = \begin{bmatrix} -6 & 1 & -4 \\ 2 & -1 & -1 \\ 1 & 6 & -1 \end{bmatrix}, \quad \mathbf{X} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}, \quad \text{and} \quad \mathbf{B} = \begin{bmatrix} 1 \\ 8 \\ -3 \end{bmatrix},$$

a. By the direct computation  $\mathbf{X} = \mathbf{A}^{-1}\mathbf{B}$ . (10%)

b. By Gauss reduction method (or Gauss elimination method). (10%)