

大葉大學 九十二 學年度 研究所碩士班 招生考試試題紙

系 所 別	組 別	考 試 科 目 (中文名稱)	考 試 日 期	節 次	備 註
機械工程研究所	甲乙丙丁	工程數學	4月13日	第1節 <small>08:30 ~ (10:00)</small>	共乙頁

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. Find the general solution of the differential equation (15%)

$$y'' + y' - 2y = -6\sin(2x) - 18\cos(2x)$$

2. Solve the initial value problem (15%)

$$y'' + 4y' + 3y = e^t; \quad y(0) = 0 \quad \text{and} \quad y'(0) = 2$$

by Laplace transform method. (Hint:  $L[e^{at}] = \frac{1}{s-a}$ )

3. Please find eigenvalues and corresponding eigenvectors of the following matrix A (20%)

$$A = \begin{pmatrix} 1 & -2 & 0 \\ 0 & 0 & 0 \\ -5 & 0 & 7 \end{pmatrix}$$

4. Let  $F(x, y, z) = xy^2 - 4x^2y + z^2$ . Please find the directional derivative of  $F$  at  $(1, -1, 2)$  in the direction of  $6i + 2j + 3k$ . (15%)

5. Please find the Fourier series of the following function assumed to have the period  $2\pi$ . (20%)

$$f(x) = \begin{cases} k, & -\frac{\pi}{2} < x < \frac{\pi}{2} \\ 0, & \frac{\pi}{2} < x < \frac{3\pi}{2} \end{cases}$$

6. A particle moves once counterclockwise about the circle of radius 6 about the origin, under the influence of the force  $F = (e^x - y + x \cosh(x))i + (y^{3/2} + x)j$ . Please calculate the work done by this force. (15%)