

大葉大學九十學年度研究所碩士班招生考試試題紙

系 所 組 別	考 試 科 目 (中 文 名 稱)	考 試 日 期	備 註
機研所甲、乙、丙組	工程數學	4 月 22 日 第 1 節	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

$$x^3 y''' + xy' - y = x \ln x \quad (15\%)$$

2. Solve the initial problem

$$\begin{aligned} x'' + y' + 3x &= 15e^{-t} & x(0) &= 35, & x'(0) &= -48 \\ y'' - 4x' + 3y &= 15 \sin 2t & y(0) &= 27, & y'(0) &= -55 \end{aligned} \quad (30\%)$$

3. Find out (1) what type of conic section the following quadratic form represents and transform it to principal axes (15%); (2) the direction of the principal axes in the x_1x_2 -coordinates (10%).

$$Q = 17x_1^2 - 30x_1x_2 + 17x_2^2 = 128$$

4. Expand $f(x) = \begin{cases} 0, & -\pi < x < 0 \\ \pi - x, & 0 \leq x < \pi \end{cases}$ in a Fourier series. (10%)

5. Prove (1) $\nabla \times \nabla \phi = 0$ where ϕ is a scalar function (10%)

- (2) $\nabla \cdot (\nabla \times \bar{v}) = 0$ where $\bar{v}$ is a vector function (10%)