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
機電自動化工程研究所	甲	工程數學	4 月 13 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 the differential equation (15%)

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

2. Solve the initial value problem (15%)

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

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 2π. (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%)