

大葉大學 九十三年 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
機電自動化研究所	甲	工程數學	3月28日	第一節	共二頁

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） 08:30~10:00

1. Find the general solution of the differential equation (20%)

$$y'' + y = x + \sin x$$

2. Using the Laplace transform, solve the following problem (20%)

$$y'' + 3y' + 2y = u(t-2) - u(t-3) \quad y(0) = 0, \quad y'(0) = 0$$

which  $u(t-a)$  is unit step function, by definition  $u(t-a) = 0$  for  $t < a$ ,

$$u(t-a) = 1 \text{ for } t > a$$

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

$$A = \begin{bmatrix} 1 & 1 & -2 \\ -1 & 2 & 1 \\ 0 & 1 & -1 \end{bmatrix}$$

4. Please evaluate  $\iint_S (7xi - zk) \cdot n \, dA$ , over the sphere  $S: x^2 + y^2 + z^2 = 1$

(a) by divergence theorem of Gauss (10%)

(b) by directly integral (10%)

5. Solve the following partial differential equations (PDE) by separation of variables (20%)

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} \quad 0 \leq x \leq 2, \quad t > 0$$

Boundary conditions:  $u(0, t) = 1, \quad u(2, t) = 3$

Initial conditions:  $u(x, 0) = 0$