

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
食 工 (甲)	工 程 數 學	4 月 22 日 第 3 節	

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) Solve the following ordinary differential equations :

a. $3x y^2 y' + y^3 = 0$ (6%)

b. $y' + x^3 y = 4x^3$ (7%)

c. $x y' = x + y$ (7%)

(2) Solve the following ordinary differential equations :

a. $y' - y = e^{2x}$ (7%)

b. $y'' - 4y' + 4y = 0$ (6%)

c. $x^2 y'' - x y' - 3y = 0$ (try $y = x^m$) (7%)

(3) Find the Laplace transform of :

a. $a + b t + c t^2$ (a, b, c are constants) (5%)

b. $e^{(a - b t)}$ (a, b are constants) (5%)

(4) Find the inverse of :

a. $\frac{9}{s^2 + 3s}$ (5%)

b. $\ln\left(\frac{s}{s-1}\right)$ (5%)

(5) Solve the following ODE by Laplace transform

a. $y'' + y' - 6y = 1, y(0) = 0, y'(0) = 1$ (10%)

b. $\begin{cases} y_1' = 6y_1 + 9y_2 \\ y_2' = y_1 + 6y_2 \end{cases} \quad y_1(0) = -3, y_2(0) = -3$ (10%)

(6) Given two vectors $\mathbf{A} = [t, t^2, t^3]$ and $\mathbf{B} = [\sin t, 10, 0]$

$\frac{d}{dt} (\mathbf{A} \cdot \mathbf{B}) = ?$ and $\frac{d}{dt} (\mathbf{A} \times \mathbf{B}) = ?$ (10%)

(7) Find the eigenvalues and eigenvectors of the matrix (10%)

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & -3 & 0 \\ 0 & 0 & 2 \end{pmatrix}$$