

大葉大學 99 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
機械與自動化工程學 系碩士班	甲、乙、丙組	工程數學	3月21日	第一節 (8:30 ~ 10:00)	試題共一頁

說明 1：不准攜帶計算機、其他作答輔助工具及參考資料。

說明 2：答題應詳列運算步驟，否則一概不予計分。

說明 3：答案卷務必標明題號，無題號之計算視為草稿，不予計分。

1. (10 分) Given $\mathbf{A} = \begin{bmatrix} 1 & -2 \\ 0 & 5 \\ -3 & 4 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} 0 & 1 & -2 \\ -1 & 8 & 6 \end{bmatrix}$, find the matrix products (a) \mathbf{AB} , (b) \mathbf{BA} .

2. (10 分) Find the determinant $\begin{vmatrix} 29 & 3 & 2 & 18 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 8 & 13 & 0 & 21 & 3 & 4 \\ -6 & 4 & 0 & -7 & -2 & 9 \end{vmatrix} = ?$

3. (15 分) Obtain the complete solution of the differential equation $4ydx + xdy = xy^2dx$. (Hint: Use the formula $d(x^p y^q) = x^{p-1} y^{q-1} (pydx + qxdy)$).

4. (15 分) Solve the differential equation $y''' - 3y'' + 4y' - 2y = e^{4x}$.

5. (15 分) Use Laplace transform method to solve the initial value problem.

$$y'' + 2y' + 2y = \delta(t-2), \quad y(0) = y'(0) = 0.$$

6. (15 分) Find the Fourier series of the function $f(\theta) = \theta^2$ in $(-\pi \leq \theta \leq \pi)$. On the same diagram, sketch the function $f(\theta) = \theta^2$ and its Fourier series in the range $(-3\pi \leq \theta \leq 3\pi)$.

7. (10 分) Evaluate the integral $\iint_S \mathbf{F} \cdot \mathbf{n} dA$ by the divergence theorem where $\mathbf{F} = [x^3, y^3, z^3]$ and S the sphere $x^2 + y^2 + z^2 = 9$.

8. (10 分) For the partial differential equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, use the method of separating variables to obtain an equivalent set of two ordinary differential equations (ODEs). (Do not solve the ODEs.)