44-1

淡江大學 106 學年度日間部轉學生招生考試試題

3-44

系別：物理學系三年級　　科目：應用數學

考試日期：7 月 21 日(星期五) 第 2 節　　本試題共 5 大題， 1 頁

請詳細列出各步驟及計算過程。

1. Consider the matrix $A=\begin{bmatrix}-4.0 & 4.0\\ -1.6 & 1.2\end{bmatrix}$.

(a) Find the eigenvalues and the corresponding eigenvectors of A. [12%]

(b) Find the inverse matrix of A. [8%]

2. A vector field is given by $\vec{F}= 2xyz^2\,\hat{i} + [x^2z^2 + z\cos(yz)]\,\hat{j} + [2x^2yz + y\cos(yz)]\,\hat{k}$.

(a) Calculate $\nabla x \vec{F}$. [4%]

(b) Calculate $\vec{F}\cdot d\vec{l}$, where $d\vec{l}$ is the infinitesimal path. [2%]

(c) Calculate path integral $I=\int_c \vec{F}\cdot d\vec{l}$, from point A: (0, 0, 1) to B:(1, π/4, 2) provided path is simply connected. [14%]

3. Solve the following linear differential equation with the associated boundary conditions:

$$y''(x) + y(x) = 0.001x^2, \quad y(0) = 0, \quad y'(0) = 1.5. \quad [20\%]$$

4. Consider a function $f(x) = e^{-|x|}$ on whole x-axis.

(a) Figure the function f(x). [4%]

(b) Find the Fourier integral representation of this function. [16%]

(c) Find integral $\int_0^\infty \frac{dw}{k^2+w^2}$ [4%]

5. Consider a function $f(x) = \begin{cases} e^{-x} & \text{if } x \ge 0 \\ 0 & \text{if } x \le 0 \end{cases}$.

(a) Figure the function f(x). [4%]

(b) Find the Fourier transform of f(x). [12%]