

淡江大學 102 學年度碩士班招生考試試題

34-1

系別：電機工程學系通訊與電波組 科目：工程數學

考試日期：3 月 10 日(星期日) 第 2 節

本試題共 5 大題， 1 頁

1. Given the matrix $A = \begin{bmatrix} -1 & -6 \\ 1 & 4 \end{bmatrix}$,
 - (i) Find the eigenvalues and the associated eigenvectors of A . (10%)
 - (ii) Find a matrix P such that PAP^{-1} is diagonal. (10%)
2. Find the solution of the initial value problem $y'' + 2y' + 5y = 1$, $y(0) = 0$, $y'(0) = 1$. (20%)
3. Consider the vector field $F(x, y) = 2x \cos(2y) i - [2x^2 \sin(2y) + 4y^2] j$.
 - (i) Show that $F(x, y)$ is conservative. (10%)
 - (ii) Evaluate the line integral $\int_c F \cdot dR$, where c is any path in the plane from $(0, 0)$ to $(1, 0)$. (10%)
4. Compute the Fourier transform of the following functions.
 - (i) $f(t) = \begin{cases} 1, & -1 \leq t < 1 \\ 0, & \text{otherwise} \end{cases}$ (10%)
 - (ii) $f(t) = \begin{cases} \cos(t-10), & 9 \leq t < 11 \\ 0, & \text{otherwise} \end{cases}$ (10%)
5. Let $Y = \cos(100 + X)$, and X is a uniform random variable in the interval $(0, 2\pi)$. Find the expected value and the variance of the random variable Y . (20%)