



國立臺灣海洋大學 100 學年度轉學生入學招生考試試題

考試科目：工程數學

\*可使用計算機

系所名稱：日機械三、日系工三

1. 答案以橫式由左至右書寫。2. 請依題號順序作答。

1. [30%] Given the following matrix

$$\underline{A} = \begin{bmatrix} 2 & 1 & 5 \\ 0 & -5 & 2 \\ 0 & 0 & 4 \end{bmatrix} \quad (1)$$

- (i) What is the trace of the matrix  $\underline{A}$ ? (5%)
- (ii) What is the determinant of matrix  $\underline{A}$ ? (5%)
- (iii) Determine the eigenvalues and eigenvectors for matrix  $\underline{A}$ . (10%)
- (iv) Perform the diagonalization of the matrix  $\underline{A}$ . (5%)

2. [25%] Find the Fourier series of the periodic function  $f(x)$  defined as

$$f(x) = \begin{cases} 1-x & 0 \leq x \leq 1 \\ 1+x & -1 \leq x < 0 \end{cases} \quad (2)$$

3. [25%] Find the homogeneous solution of the following O.D.E. equation

$$a \frac{d^2 y}{dt^2} + b \frac{dy}{dt} + cy = f(t) \quad (3)$$

assume  $a, b, c$  are given as  $a = 1, b = 4, c = 4$

4. [20%] Consider these three points  $(3, 2, 1)$ ,  $(8, 6, 4)$  and  $(5, 4, 3)$

- (i) Proof the three points are not collinear (10%)
- (ii) Find the surface  $f(x, y, z) = ax + by + cz + d = 0$  in three-dimensional space that passes these three points (10%)