

國立臺灣海洋大學九十三年度研究所碩士班招生考試試題

系所名稱：輪機工程系碩士班

*答案以橫式由左至右書寫於答案卷上

科目名稱：工程數學

1. Solve the following initial-value problem. (10分)

$$\frac{d^2y}{d\theta^2} + y = 0 \quad y\left(\frac{\pi}{3}\right) = 0 \quad y'\left(\frac{\pi}{3}\right) = 2$$

2. Find the Laplace transform of the following function. (10分)

$$f(t) = \begin{cases} t & 0 \leq t < 2 \\ 0 & t \geq 2 \end{cases}$$

3. Use the Laplace transform to solve the following initial-value problem. (15分)

$$y'' + 4y' + 6y = 1 + e^{-t} \quad y(0) = 0 \quad y'(0) = 0$$

4. Find the eigenvalues and eigenvectors of the following matrix. (15分)

$$\begin{bmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 4 & 0 & 1 \end{bmatrix}$$

5. Evaluate $\oint_C (x^5 + 3y)dx + (2x - e^{y^3})dy$, where C is the circle

$$(x-1)^2 + (y-5)^2 = 4 \quad (10分)$$

6. Expand the following function in an appropriate cosine or sine series. (15分)

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

7. Solve the following partial differential equation. (15分)

$$y \frac{\partial u}{\partial x} + x \frac{\partial u}{\partial y} = 0$$

8. Find the inverse of the following matrix, if it exists. (10分)

$$\begin{bmatrix} 2 & -1 & 5 \\ 3 & 0 & -2 \\ 1 & 4 & 0 \end{bmatrix}$$