

系所組別：系統及船舶機電工程學系甲乙丙丁組

考試科目：工程數學

考試日期：0223，節次：3

※ 考生請注意：本試題不可使用計算機

(15%) 1. Find the solution of  $x^3 y''' + 7x^2 y'' - 2xy' - 10y = 0$ ,  $y(1) = 1$ ,  $y'(1) = -7$ ,  $y''(1) = 44$ .

(15%) 2. Find the solution of  $y'' - y = x$ ,  $y(0) = 1$ ,  $y'(0) = 1$  by the Laplace transform.

(10%) 3. Find the eigenvalues and eigenvectors of 
$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & 4 & 0 \\ 6 & 4 & 2 \end{bmatrix}.$$

(10%) 4. Find an equation of the plane through  $(1, 1, 1)$ ,  $(5, 0, -5)$ ,  $(3, 2, 0)$ .

(10%) 5. Evaluate  $\iint_S (\text{curl } \vec{F}) \cdot \vec{n} \, dA$ , where  $\vec{F} = [e^{2z}, e^z \sin y, e^z \cos y]$ ,

$S: z = y^2$  ( $0 \leq x \leq 4$ ,  $0 \leq y \leq 1$ ),  $\vec{n}$  is the unit normal vector of  $S$ .

(10%) 6. Find the principal value of  $(1+i)^{1-i}$ .

(15%) 7. Integrate  $\oint_C \frac{z^2 - 4}{z^2 + 4} dz$ ,  $C: |z + 3i| = 2$  (counterclockwise).

(15%) 8. Integrate  $\int_{-\infty}^{\infty} \frac{dx}{(x^2 + 1)(x^2 + 9)}$ .