

系 所：機械工程學系

考試科目：工程數學

考試日期：0210，節次：3

第 1 頁，共 1 頁

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Solve  $y(x)$  where  $x^2 y'' - 5xy' + 8y = 2 \ln(x)$  (20%)

2. Find the steady-state of  $u(x, y)$  (20%)

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}, \quad u(x, 0) = 0, \quad u(24, y) = 25, \quad u_x(0, y) = 0, \quad u_x(24, y) = 0$$

3. Solve  $y(t)$ ,  $y'' + 7y' + 12y = \begin{cases} 0 & \text{if } 0 < t < 1 \\ 3 & \text{if } t > 1 \end{cases}$ ,  $y(0) = 3$ ,  $y'(0) = 4$  (10%)

4. Solve the simultaneous differential equations by the method of diagonalization.

$$\begin{cases} x_1' = x_1 - 10x_2 + t \\ x_2' = -x_1 + 4x_2 + 1 \end{cases} \quad \text{for} \quad \begin{cases} x_1(0) = 0 \\ x_2(0) = 0 \end{cases} \quad (20\%)$$

5. Evaluate the surface integral  $\iint_S \vec{F} \cdot \vec{n} dA$ , where

$$\begin{cases} \vec{F} = [4x \ x^2 y \ -x^2 z] \\ S \text{ is the surface of the tetrahedron with vertices } (0,0,0), (1,0,0), (0,1,0), (0,0,1) \end{cases} \quad (20\%)$$

6. Evaluate  $\oint_{\gamma} \frac{2z+1}{z^2+3iz} dz$ , where  $\gamma$  is the circle of  $|z+3i|=2$ . (10%)