

科目：工程數學

適用：土木系三

編號：711

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

本 試 題
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第 壹 頁

1. (20%) Solve the differential equation $y'' - 3y' + 2y = 10 \sin x$, with the boundary conditions $y(0) = 5$ and $y'(0) = 4$.

2. (10%) (a) $f(t) = \sin^2 t$, find the Laplace transform of $f(t)$.

(10%) (b) $F(s) = \frac{2s}{s^2 + 6s + 13}$, find the inverse Laplace transform of $F(s)$.

3. (20%) Solve the linear system of equations:

$$2x_1 + x_2 - 3x_3 + x_4 = 6$$

$$x_1 - 2x_2 + 2x_3 - x_4 = -2$$

$$x_2 - 2x_3 + 4x_4 = 6$$

$$-x_1 + 3x_2 + 2x_3 = -3$$

4. (12%) Calculate the value of the determinant:

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

5. $\nabla = \frac{\partial}{\partial x} \vec{i} + \frac{\partial}{\partial y} \vec{j} + \frac{\partial}{\partial z} \vec{k}$, $f(x, y, z) = \sqrt{x^2 + y^2 + z^2}$, calculate

(4%) (1) ∇f

(4%) (2) $\nabla \cdot (\nabla f)$

(4%) (3) $\nabla \times (\nabla f)$

6. (16%) Calculate the double integral $\iint_R (x + y) dx dy$ over a region R shown on the right.

