

系所組別： 工程科學系甲、乙、丙、丁、戊、己組

考試科目： 工程數學

考試日期：0307·節次：3

※ 考生請注意：本試題 可 不可 使用計算機

1. Solve the differential equation

$$\frac{d^2x}{dt^2} + 4x = \sin(2t), \quad x(0) = 1, \quad \frac{dx}{dt}(0) = 1 \quad (20\%)$$

2. Calculate
- A^{50}
- where
- A
- is given as

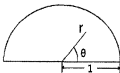
$$A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & 2 \end{bmatrix} \quad (20\%)$$

3. Given
- $\vec{F} = yx^2\vec{i} - xy^2\vec{j} + z^2\vec{k}$
- to evaluate
- $\iint_S (\nabla \times \vec{F}) \cdot \vec{n} d\sigma$

where S is the hemisphere $x^2 + y^2 + z^2 = 4, z \geq 0$ (20%)

4. Solve the following P.D.E.

$$\frac{\partial^2 u}{\partial r^2} + \frac{1}{r} \frac{\partial u}{\partial r} + \frac{1}{r^2} \frac{\partial^2 u}{\partial \theta^2} = 0 \quad \text{with } u(1, \theta) = \theta(\pi - \theta), \quad u(r, 0) = u(r, \pi) = 0$$



(20%)

5. Evaluate
- $\int_0^{\infty} \frac{\sin(mx)}{x} dx$
- (20%)