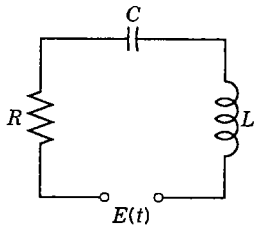
科目 工程數學 類組別 A5 共 1 頁 第 1 頁

一、 計算題 計算題需計算過程，無計算過程者不予計分

(1) Solve $sinxcosydx + cosxsinydy = 0$ (7%)

(2) Solve $y'' + 4y' + (\pi^2 + 4)y = 0,\ y\left(\frac{1}{2}\right) = 1,\ y'\left(\frac{1}{2}\right) = -2$ (8%)

(3) Find the "steady-state" current in the RLC circuit. If R = 10 Ω, L = 10 H, C = 0.01 F, E =100 $sin\, t$ V (10%)



二、 計算題 計算題需計算過程，無計算過程者不予計分

(1) If a matrix **A** is given as $\mathbf{A}^{-1} = \begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$, find its inverse matrix, $\mathbf{A}^{-1}$=? (8%)

(2) Find eigenvalues and their corresponding eigenvectors of the matrix $C = \begin{bmatrix} 3 & 5 & 3 \\ 0 & 4 & 6 \\ 0 & 0 & 1 \end{bmatrix}$ (10%)

(3) For a square matrix A, show that A^{-1} exists if and only if the eigenvalues $\lambda_1, \lambda_2, \lambda_3, \ldots, \lambda_n$ are all nonzero, and then A^{-1} has the eigenvalues $1/\lambda_1, 1/\lambda_2, 1/\lambda_3, \ldots, 1/\lambda_n$. (7%)

三、 計算題 計算題需計算過程，無計算過程者不予計分

(1) If a force is given by $\vec{F} = (x^2 + y^2 + z^2)^n\left(x\vec{\imath} + y\vec{\jmath} + z\vec{k}\right)$ find
1. $\nabla \cdot \vec{F}$ (10 %) 2. $\nabla \times \vec{F}$ (10 %) 3. ϕ, such that $\vec{F} = -\nabla\phi$ (10 %)

(2) Find the surface area of the plane $x + 2y + 2z = 12$ cut off by $x = 0$, $y = 0$, $x^2 + y^2 = 16$. (20%)