臺灣綜合大學系統

107 學年度 學士班
轉學生聯合招生考試

試　題

類組：D09

科目名稱：工程數學

科目代碼：D0992

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※本項考試依簡章規定各考科均「不可以」使用計算機　　　　本科試題共計　1　頁

1. Solve the initial-value problem $y'' + y = 4x + 10\sin x,\ y(\pi) = 0,\ y'(\pi) = 2$ by the method of undetermined coefficients. (25%)

2. (a) Find the Laplace transform of $\cos 5t$. (5%)

   (b) Find the inverse Laplace transform of $\dfrac{1}{s-1}$. (5%)

   (c) Use the Laplace transform to solve the initial-value problem
   $y' - y = 2\cos 5t,\ y(0) = 0$. (15%)

3. Given a matrix $A = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$.

   (a) Find the eigenvalues of A. (5%)

   (b) Find the orthonormal eigenvectors of A. (10%)

   (c) Find $\sin(3A)$. (10%)

4. Verify Green's theorem by evaluating both integrals in
   $\oint_C 3x^2 y\, dx + (x^2 - 5y)\, dy = \iint_R (2x - 3x^2)\, dA$, where C is the rectangle with vertices $(-1, 0)$, $(1, 0)$, $(1, 1)$, $(-1, 1)$ and R is its interior region. (25%)