國立中央大學102學年度碩士班考試入學試題卷

所別：生物醫學工程研究所碩士班 生醫訊號與器材組(一般生)　科目：工程數學　共 1 頁 第 1 頁

本科考試可使用計算器，廠牌、功能不拘　　＊請在試卷答案卷（卡）內作答

參考用

1. [8%] Solve the following differential equations: $\frac{d^2y}{dx^2} + 4y = x \cdot \sin 2x$.

2. [8%] Find the integral of P = $\int_0^{\pi} \frac{\cos\theta}{10-6\cos\theta} d\theta$.

3. [10%] Solve the differential equations using the ***Laplace transform***:

   $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} - 2y = e^{-\frac{x}{4}}$, subject to $y(0) = 0, y'(0) = 1$.

4. [12%] Calculate $(A^TA)^{-1}A^T$ or $A^T(AA^T)^{-1}$. Then find the left-inverse and/or a right-inverse (when they exist) for $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 0 & 1 \end{bmatrix}$.

5. [12%] Show that the eigenvalues of A equal the eigenvalues of A^T. Provide an example that the eigenvectors of A and A^T are not the same.

6. 試述傅立葉轉換之原理與舉一例說明其應用 (20%)

7. 何謂 Green's theorem?試舉例說明 (15%)

8.試舉例說明一階常微分方程式的一般解與特殊解之異同(15%)