國立中央大學 109 學年度碩士班考試入學試題

所別： 電機工程學系 碩士班 固態組(一般生)　　共 1 頁 第 1 頁

電機工程學系 碩士班 系統與生醫組(一般生)

科目： 工程數學(不含複變)

本科考試禁用計算器 ＊計算題需計算過程，無計算過程者不予計分　　＊請在答案卷(卡)內作答

1. Let $A=\begin{bmatrix}0 & 0 & 1 & 0\\ 1 & 0 & 0 & 1\\ 0 & -1 & 3 & 0\\ 2 & 1 & 4 & -3\end{bmatrix}$ and $B=\begin{bmatrix}1 & 2 & 3 & 4 & 5 & 6\\ 2 & 3 & 4 & 5 & 6 & 7\\ 3 & 4 & 5 & 6 & 7 & 8\\ 4 & 5 & 6 & 7 & 8 & 9\end{bmatrix}$

   (a) Compute the rank of matrix A (10%)

   (b) Find the nullity of matrix B^TA (10%)

2. Let $A=\begin{bmatrix}-1 & 0 & 1\\ 0 & 2 & 0\\ 0 & -3 & 1\end{bmatrix}$

   (a) If A is diagonalizable, then find a matrix P that diagonalizes A. (10%)

   (b) Compute A^{11}. (10%)

3. Solve the following differential equations:

   (a) $dy/dx = y^2 - 4$ (10%)

   (b) $y' = \frac{y}{x} + \frac{2x^3\cos(x^2)}{y}$, $y(\sqrt{\pi}) = 0$ (10%)

4. Find the inverse Laplace Transform for $\frac{1}{s^2}\left(\frac{s-2}{s^2+4}\right)$ (20%)

5. Solve $y''(t)+9y(t)=f(t)$ through Fourier series approach, where $f(t)$ is shown in Fig. 1 (20%)

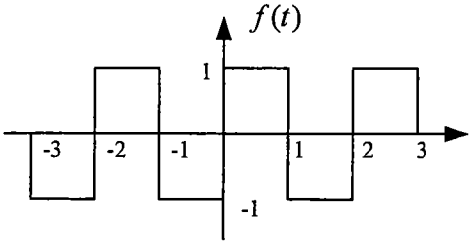

Fig.1

參考用