國立中央大學100學年度碩士班考試入學試題卷

所別：電機工程學系碩士班 電波組(一般生)　科目：工程數學(不含複變)　共 1 頁 第 1 頁

本科考試禁用計算器

＊請在試卷答案卷（卡）內作答

參考用

1. (15%) Prove that if matrix A and matrix B are similar n×n matrices, then they have the same eigenvalues.

2. (a) (10%) Find the least squares solution of the following system $Ax=b$.
   (b) (10%) Find the orthogonal projection of b onto the column space of A.

   For the above questions, where $A=\begin{bmatrix}0 & 2\\ 3 & 0\\ 1 & 0\end{bmatrix}$, $b=\begin{bmatrix}1\\ 1\\ 3\end{bmatrix}$.

3. (a) (10%) Find the determinant of the matrix A by using cofactors method.
   (b) (10%) Show the sum of all eigenvalues of A.

   For the above questions, where $A=\begin{bmatrix}2 & 0 & 0 & 0\\ 4 & -2 & 0 & 0\\ -5 & 6 & 1 & 0\\ 1 & 5 & 3 & 3\end{bmatrix}$.

4. (15%) Find a general solution of following equation.

   $y''+y=\csc x+x$

5. (15%) Find the inverse Laplace transform of the following function.

   $F(s)=\dfrac{s^3}{s^4+4a^4}$

6. (15%) For two continuous-time periodic signals $x(t)=e^{-2t}$, for $0\le t\le T$ and $h(t)=e^{j2\pi k_0 t/T}$, both the signals $x(t)$ and $h(t)$ have the same repetition period $T=2$ and k_0 belongs to an integer. Please find the Fourier series coefficients for $y(t)=x(t)h(t)$ in terms of k_0.