國立中央大學99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

固態組(一般生)

＊請在試卷答案卷（卡）內作答

＊本科考試禁用計算器

1. (10%) Find an orthonormal basis for the solution space of the homogeneous system of linear equations.

$$\begin{aligned} x_1 + x_2 + 7x_4 &= 0 \\ 2x_1 + x_2 + 2x_3 + 6x_4 &= 0 \end{aligned}$$

2. (15%) Transform $10x_1^2 + 2x_2^2 + x_3^2 + 6x_1x_2 = 1$ into $ay_1^2 + by_2^2 + cy_3^2 = 1$. Find a, b, and c.

3. (15%) $A = \begin{bmatrix} 3/4 & 1/4 & 0 \\ 1/4 & 3/4 & 0 \\ -1/4 & -1/4 & 2/4 \end{bmatrix}$. Find $\lim_{n\to\infty} = A^n$.

4. (15%) Solve for $y(x)$: $y' = y^2 - 2xy + x^2 + 1;\ y(1) = 2$.

5. (15%) Solve for the general solution of $y(x)$:
$x^2y'' - 5xy' + 8y = 2x\ln x + x^3;\ x > 0$.

6. (15%) Find the Laplace transform of $f(t)$ if $f(t) = \begin{cases} 0 & \text{if } t < 3 \\ t^2 & \text{if } t \geq 3 \end{cases}$

7. (15%) Plot the Fourier transform of $x(t)$ if $x(t) = \dfrac{\sin(t)\sin(t/2)}{\pi t^2}$

參考用