

國立高雄大學 106 學年度研究所碩士班招生考試試題

科目：工程數學

系所：電機工程學系

是否使用計算機：是

考試時間：100 分鐘

本科原始成績：100 分

1. (10%) A is a 2×2 matrix with $|A| = 3$, determine (a) $|2A| = ?$ (b) $|A^2| = ?$

2. (10%) $B = \begin{bmatrix} 0 & 3 & -1 \\ 1 & 0 & 1 \\ 1 & -1 & 0 \end{bmatrix}$, determine inverse of matrix B , i.e., $B^{-1} = ?$

3. (10%) Find eigenvalues and eigenvectors of $C = \begin{pmatrix} 1 & -2 \\ -2 & 1 \end{pmatrix}$

4. (10%) Orthogonally diagonalize $C = \begin{pmatrix} 1 & -2 \\ -2 & 1 \end{pmatrix}$

5. (10%)

(a) Show the three functions $p(x) = 2e^x$, $q(x) = 3e^{-x}$, and $r(x) = \cosh x$ are linear dependent

(b) Show that $f(x) = 4x^2 - 3x - 9$ lies in the space span generated by $g(x) = 2x^2 - 3$ and $h(x) = x + 1$

6. (10%) Solve $y''' - 6y'' + 12y' - 8y = 0$

7. (10%) Solve $\frac{dy}{dt} + 2y = f(t)$, $y(0) = 0$, $f(t) = \begin{cases} 1, & 0 \leq t < 2 \\ 0, & t \geq 2 \end{cases}$

8. (10%) Solve $y'' + y = e^x + e^{-x}$

9. (10%) Solve $\begin{cases} \frac{dx}{dt} = -y + t \\ \frac{dy}{dt} = x - t \end{cases}$

10. (10%) Solve $f(t) = 2t - 3 \int_0^t \sin \tau f(t - \tau) d\tau$