國立中興大學

109 學年度

碩士班考試入學招生

試　　題

學系：資訊科學與工程學系

甲組

科目名稱：基礎數學A

109學年度碩士班招生考試試題

科目： 基礎數學A　　系所： 資訊科學與工程學系 甲組

本科目不得使用計算機　　本科目試題共 2 頁

1. If A is an $n \times n$ matrix, derive the characteristic polynomial of A. (7%)

2. Let $W \subset R^4$ be the subspace of vectors (x_1, x_2, x_3, x_4) satisfying $2x_1 - x_3 + 4x_4 = 0$. Find an orthonormal basis for W. (10%)

3. Solve the differential equations, where $x(0) = 1$ and $y(0) = 0$. (7%)

$$\frac{dx}{dt} = 3x - 4y, \frac{dy}{dt} = 2x - 3y.$$

4. Please explain the reason if there is an orthogonal transformation T from R^3 to R^3. (5%)

$$T\begin{bmatrix} 2 \\ 5 \\ 0 \end{bmatrix} = \begin{bmatrix} 5 \\ 0 \\ 2 \end{bmatrix} \text{ and } T\begin{bmatrix} -5 \\ 2 \\ 0 \end{bmatrix} = \begin{bmatrix} 2 \\ -5 \\ 0 \end{bmatrix}$$

5. Given a matrix A, find (a) the reduced row echelon form R and the rank of A, (b) a low triangular matrix L and an upper triangular matrix U so that $A = LU$, and (c) the null space of A. (15%)

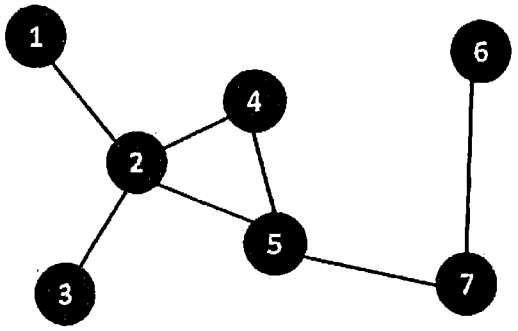
$$A = \begin{bmatrix} 2 & 4 & -2 & 2 & 4 \\ 5 & 10 & -4 & 5 & 9 \\ 3 & 6 & -2 & 1 & 9 \\ 1 & 2 & -1 & 2 & 0 \end{bmatrix}.$$

6. Let $A = \begin{bmatrix} 0 & 1 \\ 2 & 3 \end{bmatrix}$. Show that $A^2 = \begin{bmatrix} 5 & 3 \\ 6 & 14 \end{bmatrix}$ is linear combination of A and I_2. (6%)

7. Please calculate $4^{532} \pmod{11}$. (10%)

8. Let $A=\{7, 8, 9\}$. Please list all the subsets of A. (10%)

9. Please identify the minimum dominating set of the graph below. (15%)



10. Given a group G with $|G| = p$, where p is a prime number. How many different sizes of subgroups can G have? (15%)