**資訊工程學系碩士班**

國立臺南大學106學年度 招生考試 離散數學與線性代數 試題卷

**一、離散數學** (共50分)

1. (a) How many arrangements are there for all the letters in “ALALABAMA” ? (5%)

(b) How many of arrangements in part (a) have no adjacent A? (5%)

2. Let *p*(*x*) be the following open statement.

*p*(*x*, *y*): *x* + *y* = 20

Determine the truth or falsity of the following statements, where *x* and *y* are integers.

(a) ∃*y*∀*x* *p*(*x*, *y*) (4%)

(b) ∀*x*∃*y* *p*(*x*, *y*) (4%)

3. Dertermine |*A*∪*B*∪*C*| when |*A*|=30, |*B*|=300, and |*C*| = 3000, if

(a) *A* ⊆ *B* ⊆ *C* (4%)

(b) *A*∩*B* = *A*∩*C* = *B*∩*C* = ∅ (4%)

(c) |*A*∩*B*| = |*A*∩*C*| = |*B*∩*C*| = 3, and |*A*∩*B*∩*C*| = 1 (4%)

4. For positive integer *n* > 4, prove that 2*n* > *n*2 by mathematical induction. (10%)

5. Let *A* = {1, 2, 3, 4, 5}. Define the relation R on *A* by *x* R *y*, if *x* + *y* = 6

(a) List the set of R. (5%)

(b) Does the relation R satisfy the properties of reflexive, symmetric, anti-symmetric, and transitive? (5%)

**二、線性代數** (共50分)

1. State (with a brief explanation) whether the following statements are true or false. No grade is given if there is no explanation provided for your answer. (20%)
   1. The set {(1, 0), (2, 0)} is a basis for .



* 1. The vectors (0, 1, 0), (2, 0, 0), (0, 0, 3) span .



* 1. The set is a subspace of .



* 1. Let , and is a singular matrix.
  2. Let , and A is invertible.

1. Prove that the following transformation is not linear. (10%)
2. Solve the following system using decomposition, where is a lower triangular matrix and is an upper triangular matrix. Show , and solutions for , , . (10%)



1. Find the eigenvalues and eigenvectors of the matrix . (10%)