大葉大學 97 學年度　研究所碩士班　招生考試試題紙					
系 所 別	組別	考 試 科 目 (中文名稱)	考試日期	節次	備　註
資訊工程	甲	離散數學	4月13日	第二節	不可使用計算機，共2頁

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）　10:40 ~ 12:10

註：作答需**詳列過程**及**解釋原因**，否則不予計分，太複雜的算式不必乘開。

1. (15%) Use mathematical induction to prove the equality "$1\times2 + 2\times3 + \ldots + n(n+1) = n(n+1)(n+2)/3$" for all positive integers n.

2. (15%) Describe an algorithm to input an $n \times n$ matrix $A = [a_{ij}]$ and compute the product matrix A^2.

3. (10%) A positive integer is called **perfect** if it equals the sum of its positive divisors (因數) other than itself. For example, the number 6 is perfect since 6=1+2+3. Find a perfect integer larger than 25.

4. (a) (5%) How many different strings can be made by reordering the letters of the word *SUCCESS*?
   (b) (5%) How many different strings can be made by reordering the letters of the word *SUCCESS* if all three *S*s must be consecutive?

5. (10%) How many bit strings of length 10 either begin with two 0s or end with three 1s?

6. (15%) What is the solution of the recurrence relation $a_n = a_{n-1} + 2a_{n-2}$ with $a_0 = 1$ and $a_1 = 8$?

7. (10%) Let R be the relation $\{(a, b) \mid ab \geq 0\}$ on the set of integers. Is R an equivalence relation? Why?

8. (a) (10%) A **dominating set** of vertices in a simple graph is a set of vertices such that every other vertex is adjacent to at least one vertex of this set. A dominating set with the least number of vertices is called a **minimum dominating set**. Find a minimum dominating set in the following graph G.
   (b) (5%) Is the graph G a Hamiltonian graph? Why?