

大葉大學 95 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
資訊管理系碩士班	乙組	離散數學	4月23日	第2節	共一頁

(0=30 ~ 12=00)

註：考生不可攜帶計算機或其他資料作答，並且答題應詳列計算步驟，否則一概不予計分。

1. In the full binary tree with n levels

(1) How many paths are there from the root to the terminal nodes? (5%)

(2) If $0 \leq k \leq n$, how many of these paths have exactly k edges moving to the left? (5%)

2. If A is a set with n elements and $0 \leq k \leq n$, then what is the number of k -element subsets of A ?

(5%)

3. (1) Please explain the meaning of big-oh in analyzing time complexity. (10%)

(2) Assume that an algorithm needs the following execution steps. What are their big-oh?

(a) $\sum_{i=3}^{n+1} i$ (b) $\sum_{i=5}^{n+3} 1$ (c) $\sum_{i=1}^n (3i + 7)$ (d) $\sum_{i=1}^n (5i^2 + 6)$ (20%)

4. Someone says: "I am lying." Why can the sentence not be either true or false? (10%)

5. (1) Prove that the Catalan numbers $C_n = \frac{1}{n+1} \binom{2n}{n} = \binom{2n}{n} - \binom{2n}{n-1}$ (10%)

(2) Are the Catalan numbers C_n whole numbers? Why? (5%)

6. Prove that the following two statements are logically equivalent if m is a positive integer. (10%)

(i) m is even.

(ii) m^2 is even.

7. Solve the recurrence relation $a_n = 5a_{n-1} - 6a_{n-2} + 4n$, $n \geq 2$, $a_0 = 9$, $a_1 = 14$. (10%)

8. (1) Simplify the Boolean function $\overline{(x+y)} + z + x(xz + \bar{y}\bar{z})$ by using the method of Karnaugh maps.

(7%)

(2) Draw the circuit diagram of the above optimal expression. (3%)