

# 國立交通大學 97 學年度碩士班考試入學試題

科目：資料結構(5082)

考試日期：97 年 3 月 9 日 第 2 節

系所班別：工業工程與管理學系

組別：工工管系甲組

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【可使用計算機】\*作答前請先核對試題、答案卷(試卷)與准考證之所組別與考科是否相符!!

1. (A) Please define big-Oh notation (i.e.  $O(f(x))$ ), and big-Theta notation (i.e.  $\Theta(f(X))$ )

(6%)

- (B) Prove or disprove the following equalities.

(5%) (a)  $\sum_{i=1}^n i = O(n^3)$

(5%) (b)  $\sum_{i=1}^n i^2 \log(i) = \theta(n^3)$

2. (10%) Suppose that we have numbers between 1 and 1000 in a binary search tree and want to search for the number 363. Which of the following sequences could not be the sequence of nodes examined and why?

- A. 925, 204, 910, 240, 913, 245, 363
- B. 903, 230, 911, 244, 898, 258, 359, 363
- C. 10, 252, 400, 398, 340, 345, 397, 363
- D. 835, 278, 347, 521, 299, 392, 358, 363
- E. 102, 399, 387, 219, 266, 382, 381, 278, 363

3. (7%) Please define the complexity classes NP-complete and NP-hard. Are they equal?

There are many records in a file. Now we want to search a record from that file.

Please answer the following questions.

- 4. For a heap file, assume the unordered records are stored in  $b$  blocks. If it involves a linear search, how many blocks do we need to access on average? (4 %)
- 5. For a sequential file, assume the records are stored in  $b$  blocks according to one ordering field. If it involves a binary search, how many blocks do we need to access on average? (4 %)
- 6. For a hash file, assume the records are stored in  $b$  blocks according to a well-designed hash field. If it involves a hash function based search, how many blocks do we need to access in the best case? (4 %)
- 7. For a file with a primary index access structure, give an example for describing how it works. (7 %)
- 8. For a file with a clustering index access structure, give an example for describing how it works. (7 %)
- 9. For a file with a secondary index access structure, give an example for describing how it works. (7 %)



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10. (a) Write a program that can construct a binary tree from the input file of "data.dat". (18%)
- (b) Trace your program of constructing the binary tree by using the following set of data in the file. (10%)  
"25, 14, 37, 7, 19, 35, 27, 38, 40".
- (c) Analyze the complexity of your program. (6%)