

大葉大學 九十二 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
資訊管理學系 碩士班	乙組	資料結構	4月13日	第3節 (3:30~15:00)	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）

☞ 請詳列計算步驟，否則一概不計分 ☜

● 總分 100 分

1. We declare an array as  $\text{int } k[m][n]$ . Assume that each element of array  $k$  occupies 4 units of storage. Suppose the addresses of  $k[3][4]$  and  $k[2][6]$  are 700 and 800, respectively. Note that the first element of  $k$  is  $k[0][0]$ .

(a) What is the address of  $k[5][3]$ ? (5%)

(b) Is array  $k$  in row-major or column-major? Why? (5%)

(c) What are the values of  $m$  and  $n$ ? If you can not determine the values, please explain your reason. (5%)

2. (a) Write a *recursive* C function to calculate the sum of a *linearly linked list*, which is implemented by an array. Note that the list may be empty. (5%)

```
struct nodetype {
    int info;
    int next;
}
struct nodetype node[100];
int sum(int list)
```

(b) Write a recursive C function to calculate the length of a *linearly linked list*, which is implemented by an array. Note that the list may be empty. (5%)

```
struct nodetype {
    int info;
    int next;
}
struct nodetype node[100];
void length(int list)
```

3. Write a C function to delete a node of a doubly circularly linked list. (10%)

```
struct nodetype {
    int info;
    struct nodetype *left;
    struct nodetype *right;
}
void delete(struct nodetype *p) /* node p is to be deleted */
```

4. (a) What is a big-oh? Please write out its definition. (3%)

(b) What is the total number of times that  $x = x + 1$  is executed? What is the time complexity for executing  $x = x + 1$ ? (7%)

```
for i = 1 to n do
    for j = i to n do
        for k = j to n do
            x = x + 1
```

5. Which two storage ways can be used for a linear list? Please illustrate them by giving an example, and list their advantages and disadvantages, respectively. (10%)

6. (a) Take 13, 9, 7, 12, 15, 4, 3, 10 as an example to explain how the merge sort performs sorting. (5%)  
 (b) What is the time complexity of merge sort? Why? (Assume that there are  $n$  input data elements.) (5%)  
 (c) Write a recursive C function to perform the merge sort. Note that you can use the following 2-way merge function as a basic function to implement your merge sort. In other words, you need not write the 2-way merge function. (5%)

```
void twoway(int a[ ], int b[ ], int c[ ])
/* a[ ] and b[ ] are input sorted array */
/* c[ ] is the output array after a[ ] and b[ ] are merged */
```

7. (a) Take 3,1,2,5,4 as an example to explain how the heapsort performs sorting. (5%)  
 (b) What data structure is used in the heapsort? Please describe its definition. (5%)  
 (c) What is the time complexity of heapsort? Assume that there are  $n$  input data elements. You need not derive the formula in detail; you need only give your reasoning. (5%)

8. (a) Given the binary tree whose inorder and postorder sequences are “BCDAFEHIG” and “DCBFIHGGEA”, respectively, what is the binary tree? Please solve the problem step by step. (5%)

- (b) Convert the infix expression “ $A \div B \times (C - D) + E$ ” into a binary tree and find its prefix representation. (5%)

9. Find the shortest path lengths between all pairs of vertices in the following directed graph with weights on edges. (5%)

