136 -1

淡江大學 96 學年度碩士班招生考試試題

系別：資訊管理學系　　科目：資 料 結 構

准帶項目請打「V」
簡單型計算機

P1　本試題共 2 頁

Notice : Please make your answers as clear and readable as possible

1. The intermediate results of a sorting process are shown below. Please indicate which sorting method is used and explain why. (17%)

(36 8 37 4 81 12 69 15 50 20)
(12 8 20 4 15 36 69 81 50 37)
(4 8 12 20 15 36 69 81 50 37)
(4 8 12 20 15 36 69 81 50 37)
(4 8 12 15 20 36 69 81 50 37)
(4 8 12 15 20 36 50 37 69 81)
(4 8 12 15 20 36 37 50 69 81)
(4 8 12 15 20 36 37 50 69 81)

2. (a) Please discuss sequential search and binary search.
(b) Compare them by explaining their advantages and disadvantages. (16%)

3. Regarding hashing, answer the following questions.
(a) Give two properties of a good hashing function.
(b) Give a good hashing function.
(c) Define linear probing.
(d) Define chaining. (16%)

4. (a) Please define max heap.
(b) Nine integers are inserted into an empty max heap in the following order. Please draw the final max heap. The properties of the max heap must be kept after each integer is inserted. (16%)
60, 40, 20, 82, 94, 16, 25, 53, 56

5. The "quad tree" for the image containing a black object in Figure 1 is shown in Figure 2. The area of the image is 64 (8 X 8). You have to figure out the correspondence between them to answer the questions. (a) Please define the data structure of the quad tree. (b) Suppose the tree has been constructed. Please give the algorithm for calculating the area of the object based on the quad tree. (20%)

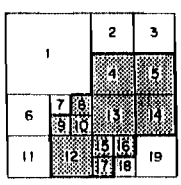

Figure 1

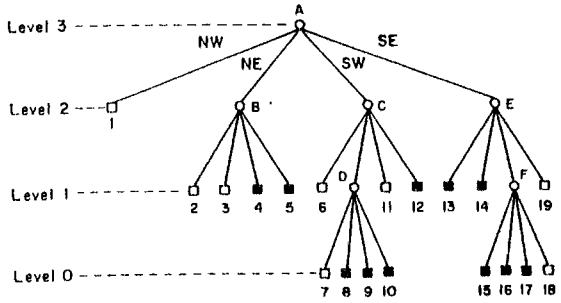

Figure 2.

本試題雙面印製

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6. The following program is to insert nodes into a linked list ptr. Initially, the linked list is empty. A sequence of input lines are given. If the input line is "i 4 2", a node containing 2 is inserted after the 4th node in the list. If there is no the 4th node in the list, an error message is printed and the program stops. If the input line is "i 0 5", a node containing 5 is inserted as the first node. If the input line contains a character which is not 'i', the program prints the integers in the list sequentially and stops. For example, "g". Please complete the program. (15%)

```
#include <stdlib.h>
#include <stdio.h>

typedef struct list_node * list_pointer;
typedef struct list_node {
        int data;
        list_pointer link;
        };
void insert(list_pointer * ptr, list_pointer node, int x);
void search(list_pointer ptr, list_pointer * node, int i);

main()
{
   list_pointer ptr = _____(1)_____ , node;
   char op;
   int i, x;
   scanf(" %c", &op);
   while ( _____(2)_____ )
      {
        scanf("%d", &i);
        scanf("%d", &x);
        search( _____(3)_____ , _____(4)_____ , i);
        insert( _____(5)_____ , _____(6)_____ , x);
        scanf(" %c", &op);
      }
   while ( ptr != NULL )
       { printf("%d \n", ptr->data);
           ptr = ptr->link;
       }
   return 0;
}
```

```
void insert(list_pointer * ptr, list_pointer node, int x)
{
  list_pointer temp;
  temp=  (list_pointer) malloc(sizeof ( _____(7)_____ ));
  _____(8)_____ ;
  if (*ptr)
     { if (node == NULL)
         { temp->link = *ptr;
       *ptr = temp;
         }
        else
         { _____(9)_____ ;
           _____(10)_____ ;
         }
     }
  else
     {  _____(11)_____ ;
        _____(12)_____ ;
     }
  return;
}

void search(list_pointer ptr, list_pointer * node, int i)
{
  int j = 0, found = 0;
  if (i == 0)
    *node = NULL;
  else
     { while ( (ptr != NULL) && (!found) )
       { j++;
         if (i == j)
            {  _____(13)_____ ;
               _____(14)_____ ;
            }
         _____(15)_____ ;
       }
        if (!found)
       { printf("there is no %dth node in the linked list\n", i);
         exit(1);
       }
     }
  return;
}
```