國立嘉義大學 104 學年度

資訊工程學系碩士班招生考試試題

科目：資料結構

一、選擇題

1. The pseudo codes shown below are a sorting algorithm. What kind of sorting algorithm is it? (10%)
   (a) bubble sort
   (b) heap sort
   (c) quick sort
   (d) merge sort

```
void sorting( int list[], int left, int right)
{
    int value, i, j;
    int temp;
    if (left < right) {
        i = left;       j = right+1;
        value = list[left];
        do {
            do i++; while (list[i] < value);
            do j--; while (list[j] > value);
            if (i < j) SWAP(list[i], list[j], temp);
        } while (i < j);
        SWAP(list[left], list[j], temp);
        sorting(list, left, j-1);
        sorting(list, j+1, right);
    }
}
```

2. The pseudo codes shown below are an algorithm of producing minimum cost spanning trees. What kind of algorithm is it? (10%)
   (a) Kruskal's Algorithm
   (b) Prim's Algorithm
   (c) Sollin's Algorithm
   (d) Knuth–Morris–Pratt Algorithm

```
T= {};
while (T contains less than n-1 edges && E is not empty)
{
        choose a least cost edge (v,w) from E;
        delete (v,w) from E;
        if ((v,w) does not create a cycle in T)
        add (v,w) to T
        else discard (v,w);
}
if (T contains fewer than n-1 edges)
    printf("No spanning tree\n");
```

3. Which of the description about a max heap is not the correct one?(10%)
   (a) a complete binary tree
   (b) a finite set of one or more nodes
   (c) the key value in each node is no smaller than the key values in its children
   (d) the keys in the right subtree are larger than the key in the root

二、問答題

1. The original input list is (27, 6, 76, 5, 60, 13, 57, 16, 49, 19). Answer the following two questions. (10%)
   (a) Give the binary tree T_1 of the input list when the input order is from left to right.
   (b) Give the max heap T_2 after adjust the binary tree T_1 into a max heap.

2. The figure and pseudo codes are shown below. What is the result of executing the pseudo codes? (10%)

```
int *ip;
int x = 2, y;

ip = &x;
y   = *ip + 10;
printf("%d %u %d %u %d %u\n", x, &x, *ip, ip, y, &y);
```

variable	content	address
ip		
x	2	12468
y		13579

3. Use examples to explain the following data structures: (20%)
   (a) Array
   (b) Stack
   (c) Queue
   (d) Linked list

4. (a) Use an example to describe a quick sort algorithm. (10%)
   (b) Show that the worst-case time complexity of quick sort is $O(n^2)$. (10%)

5. Use an example to describe the operations of a priority queue. (10%)