國立中山大學106學年度碩士暨碩士專班招生考試試題

科目名稱：資料結構【資管系碩士班乙組】　　題號：442003

※本科目依簡章規定「不可以」使用計算機(問答申論題)

1. (14%)

(a) How long does it take to determine if an undirected graph contains a vertex that is connected to no other vertex by using the following data structures to represent a graph: (1) an adjacency matrix? (2) an adjacency list. (8%)

(b) Suppose we use Depth-First-Search on a binary search tree, starting from the root. The edge to a left child is always traversed before an edge to the right child. In what traversal order are the nodes visited? Finished? (6%)

2. (8%)

A "connected component" consists of all the vertices reachable from a given vertex, and the edges incident on those vertices. Write an algorithm (pseudocode) based on Depth-First-Search that counts the number of connected components in an undirected graph.

3. (10%)

Write an algorithm (pseudocode) that takes an array containing n distinct integers and calculates the sum of the k ($k <= n$) largest numbers in the array.

4. (8%)

Analyze the time required (time complexity) for the worst-case and the average-case in insertion sort.

5. (10%)

Write a recursive *delete* method for singly-linked lists with integer data that deletes the first occurrence of a given integer i from the list s and returns the resulting list.

6. (15%)

Consider the following C-like function:

```
int functionName(int a[], int b)
{
    if (b == 1) {
        return a[0];
    }
    return a[b-1]*functionName(a, b/2);
}// end of functionName
```

(a) What does the above function do? (5%)

(b) Analyze the time complexity of the above function. (10%)

7. (20%)

Consider the following infix expression:

(X+Y)*(W-Z)

(a) What are the corresponding postfix and prefix expressions? (10%)

(b) Write an algorithm to evaluate a postfix expression. (10%)

背面有題