招 生 學 年 度	102	招 生 類 別	碩士班
系 所 班 別	資訊工程學系碩士班(甲組、乙組)、資訊工程學系 網路與多媒體科技碩士班		
科　　　目	資料結構		
注 意 事 項	本考科禁止使用掌上型計算機		

1. (20%) Consider the sorting algorithms: selection sort, insertion sort, bubble sort, and quick sort. Please answer the following questions.
   (a) Which of these algorithms can be implemented as stable sorting algorithms? (5%)
   (b) What is the time complexity of each of these algorithms, if the input N data are in sorted order? (10%)
   (c) What are the time complexities of bubble sort and quick sort in best case and worse cast, respectively? (5%)

2. (30%) Please answer the following questions about binary tree.
   (a) Provide the pseudo-codes of pre-order, in-order, and post-order tree traversals. (10%)
   (b) How many binary trees can be generated if N nodes are given? (5%)
   (c) Provide a pseudo-code in recursive version to compute the height of a binary tree. The height is 1 if the binary tree contains only one node. (10%)
   (d) What are the heights of a binary search tree (BST) with N nodes in best case and worse case, respectively? (5%)

3. (15%) Consider a linked list:
   (a) What is called circular linked list and what is called double linked list? (5%)
   (b) What is the advantage for circular linked list as compared to linear linked list? (5%)
   (c) Let p be a pointer pointing to a node of a double linked list. Write a sequence of statements to delete the node pointed by p from the list. (5%)

4. (15%) Consider a AVL search tree:
   (a) What is the AVL search tree? (5%)
   (b) Consider a sequence of keys: 1,4,7,12,15,3,5,14,18. Please draw the result by inserting there keys into an empty AVL search tree? (10%)

5. (20%) Please design a sorting algorithm LinearSort(A[],n) with time complexity O(n) where A[1..n] is an unsigned integer array and all A[i] < n3, and prove your answer.