

※ 考生請注意：本試題 可 不可 使用計算機 請勿在本試題紙上作答，否則不予計分

一 選擇題 (45%=15\*3%)

(1) Assume a sequence list 1, 2, 3, 4, 5, 6 is passed as a stack, an impossible output sequence list is \_\_\_\_\_.

A. 2, 4, 3, 5, 1, 6    B. 3, 2, 5, 6, 4, 1    C. 1, 5, 4, 6, 2, 3    D. 4, 5, 3, 6, 2, 1

(2) Removing the data item at index  $i$  from a sequential list with  $n$  items, \_\_\_\_\_ items need to be shifted left one position.

A.  $n-i$     B.  $n-i+1$     C.  $i$     D.  $n-i-1$

(3) There is an algorithm with inserting an item to an ordered SeqList and still keeping the SeqList ordered. The computational efficiency of this inserting algorithm is \_\_\_\_\_

A.  $O(\log_2 n)$     B.  $O(1)$     C.  $O(n)$     D.  $(n^2)$

(4) The addresses which store a linked list \_\_\_\_\_.

A. must be sequential    B. must be partly sequential  
C. must be no sequential    D. can be sequential or discontinuous

(5) According the definition of binary tree, there will be \_\_\_\_\_ different binary trees with 5 nodes.

A. 6    B. 5    C. 4    D. 3

(6) If the Binary Tree T2 is transformed from the Tree T1, then the postorder of T1 is the \_\_\_\_\_ of T2.

A. preorder    B. inorder    C. postorder    D. level order

(7) In the following sorting algorithm, \_\_\_\_\_ is an unstable algorithm.

A. the insertion sort    B. the bubble sort    C. quicksort    D. mergesort

(8) Assume there is an ordered list consisting of 100 data items, using binary search to find a special item, the maximum number of comparisons is \_\_\_\_\_

A. 25    B. 1    C. 10    D. 7

(9) The result from scanning a binary search tree in inorder traversal is in \_\_\_\_\_ order.

A. descending or ascending    B. descending    C. ascending    D. out of order

(背面仍有題目,請繼續作答)

系所組別：會計學系乙組

考試科目：資料結構

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- (10) In a binary tree with  $n$  nodes, there is \_\_\_\_\_ non-empty pointers.  
A.  $n-1$       B.  $n+1$       C.  $2n-1$       D.  $2n+1$
- (11) In a undirected graph with  $n$  vertices, the maximum number of edges is \_\_\_\_\_ .  
A.  $n(n+1)/2$       B.  $n(n-1)/2$       C.  $n(n-1)$       D.  $n^2$
- (12) The priority queue is a structure implementing \_\_\_\_\_  
A. inserting an item only at the rear of the priority queue.  
B. inserting an item only at the front of the priority queue.  
C. deleting an item according to the priority of the items.  
D. first in/first out
- (13) The output from scanning a minimum heap with level traversal algorithm \_\_\_\_\_ .  
A. must be an ascending sequence.  
B. must be descending sequence.  
C. must have a minimum item at the head position.  
D. must have a minimum item at the rear position.
- (14) Assume the preorder of  $T$  is ABEGFCDH, the inorder of  $T$  is EGBFADHC, then the postorder of  $T$  will be \_\_\_\_\_ .  
A. GEFBHDCA      B. EGFBHDCA      C. GEFBDHCA      D. GEBFDHCA
- (15) When a recursive algorithm is transformed into a non-recursive algorithm, a structure \_\_\_\_\_ is generally used.  
A. SeqList      B. Stack      C. Queue      D. Binary Tree

## 二 問答題

1. Please convert the following infix expression  $(a*(b+c))+(b/d-e)*a$  into postfix expression, in the converting process, please draw the change of operator stack and the change of the output. (5 points)

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2. Assume a list is {48,35,64,92,77,13,29,44}, firstly insert these items to an empty complete binary tree according to the sequence one by one, then please heapify the complete binary tree and implement the heap sort. Please draw the whole heapifying process and sorting process. (10 points)

3. Assume keys = {32, 13, 49, 55, 22, 39, 20}, Hash function is  $h(\text{key})=\text{key}\%7$ . The linear probe open addressing is used to resolve collisions. Please try to calculate the value of Hash for each key and give the final hash table. (10 points)

4. Programming problems

(1) Design an algorithm which can read in a string of integers (ended with -1) as input and then sort the input (from small to large) by the straight insertion sorting algorithm. Finally, please output the total number of moving (comparing) when conducting the sorting algorithm. For example, (15points)

Input: 12 3 234 53 11 983 -1

Output: 3 11 12 53 234 983

Total number of comparison: 5

(2) Assume there are a few characters (no more than 20) in a list. please design an algorithm to decide whether the given list is central symmetric. For example, both "abccba" and "xyzyx" are central symmetric, while "abbbcba" and "qeetcwteeq" are not. (15points)

Input: xyzyx

Output: Yes

Input: qeetcwteeq

Output: No