一 選擇題 (30%)

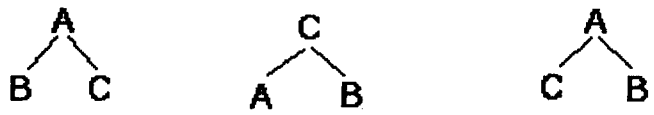
1) If a stack contained the entries *w*, *x*, *y*, *z* (from top to bottom), which of the following would be the contents after two entries were removed and the entry *r* was inserted?
A. *w*, *x*, *r* B. *y*, *z*, *r* C. *r*, *y*, *z* D. *r*, *w*, *x*

2) Which of the following is not used when determining the location of an entry in a two-dimensional homogeneous array stored in row-major order?
A. Indices B. Number of rows in the array C. Address polynomial
D. Number of columns in the array

3) The nodes in which of the trees below will be printed in alphabetical order by the following recursive procedure?

```
procedure printTree (Tree)
if (Tree is not empty)
    then (print the root node;
          apply the procedure printTree to the right subtree of Tree;
          apply the procedure printTree to the left subtree of Tree)
```

A. B. C.



4) Which of the following is most appropriate for enforcing that bracket/brace/parenthesis is matched with the most recently encountered partner?
A. queue B. binary tree C. stack D. doubly linked list

5) In a machine language, the technique in which the data to be manipulated by an instruction is included within the instruction itself is called
A. Immediate addressing B. Direct addressing
C. Indirect addressing D. Pipeline addressing

6) _____ is a specification of a set of data and the set of operations that can be performed on the data?
A. Polymorphism B. Inheritance C. Strong coupling D. Abstract data type

7) _____ is a programming language construct used to group related fields and methods
A. Object B. Class C. Record D. Pointer

8) Let $f(n) = 2n^4 + 3n^3 - 100n^2 + 1$, $g(n) = 2n \log n + n - 5$. Which of the following statements is true?

（背面仍有題目,請繼續作答）

A. $f(n) = \Theta(n^4)$ B. $f(n) = \Omega(n^5)$ C. $g(n) = \Theta(n^2)$ D. $g(n) = \Omega(n^2)$

9) Which of the following statements are true?

A. The postfix expression of 1/2+3*4-5 is 12345/+*-

B. The prefix expression of 1/2+3*4-5 is -+/12*345

C. The infix expression of 12345/+*- is (1/2+3)*4-5

D. The postfix expression of 1/(2+3)*4-5 is 123+4/*5-

10) In a circular queue we can disambiguate empty from full queues by

A. using a special symbol in the queue

B. incrementing queue positions by 2 instead of 1

C. keeping a count of the number of elements

D. none of the above

二 問答題

1. Write both iterative and recursive versions of the function that generates the nth Fibonacci number. (10%)

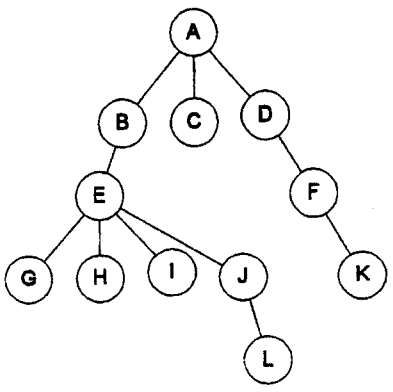
2. (8%) Consider the Tree T_1. Find

A. The degree of the tree:

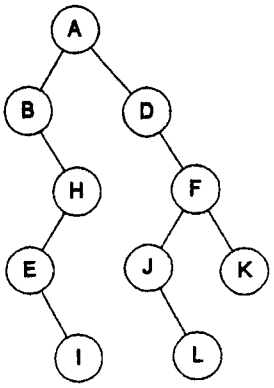
B. The depth of the tree:

C. The siblings of the node H:

D. The ancestors of the node J:



Tree T_1



Binary Tree T_2

3. (16%) Consider the Binary Tree T_2. Find

A. The inorder traversal:

B. The preorder traversal:

C. The postorder traversal:

D. The level order traversal:

4. Consider the following circular queue with front=4 and rear=1. (16%)

Q[0]	Q[1]	Q[2]	Q[3]	Q[4]	Q[5]
A	B				C

After executing the following 5 instructions: "insert D", "insert E", "Delete", "Insert F", and "Delete".

A. What is the value of the variable front?

B. What is the value of the variable rear?

C. Draw the status of the circular queue after the five instructions are executed.

5. Let x = (x1, x2, …, xn) and y = (y1, y2, .., ym) be two linked lists. Assume that in each list, the nodes are in non-decreasing order of their data field values. Write an algorithm to merge the two lists together to obtain a new linked list z in which the nodes are also in this order. (12%)

```
struct node{
    int item;
    struct node *link;
};
typedef struct node list_node;
typedef struct node *list_pointer;

list_pointer merge(list_pointer x,list_pointer){
   list_pointer temp;

   /* You fill in the code here */
}
```

6. Given a list of n elements and assuming n is larger than 100, compare the performance of the following sorting algorithms: (8%)

(A) Heap sort (B) Insertion sort (C) Quick sort (D) Merge sort

(list them in ascending order)