一、单项选择题（本大题共 15 小题，每小题 2 分，共 30 分）

提示：在每小题列出的四个备选项中只有一个是符合题目要求的，请将其代码填写在下表中。错选、多选或未选均无分。

1. Given the input order of a stack is 6, 5, 4, 3, 2, 1, ( )is not the valid output order?

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

2. If the MaxSize of a **Circular Queue** is n and there is always a space not used, front points to the previous of the front element in the queue, and rear points to the rear element in the queue. ( ) means that the Queue is Empty.

A. (rear+1) MOD n == front B. rear == front

C. rear+1 == front D. (rear-l) MOD n == front

3. In the following sorting methods, ( ) is not stable.

A. Insertion sort B. Heap C. Bubble D. Merge sort

4. In the following sorting methods, the method whose KCN(Keys Compare Number) is irrelative with the initial order of sequence is ( ).

A. Insertion sort B. Bubble sort C. Heap sort D. Selection sort

5. In the following sorting methods, ( ) need extra Θ(n) space.

A. Shell sort B. Heap sort C. Selection sort D. merge sort

6. In the following sequence, ( ) is a heap?

A. 75, 65, 30, 15, 25, 45, 20, 10

B. 75, 65, 45, 10, 30, 25, 20, 15

C. 75, 45, 65, 30, 15, 25, 20, 10

D. 75, 45, 65, 10, 25, 30, 20, 15

7. The data Structures can be divided into ( ) according to their **Physical form**

A. Array-based structures and Linked structures

B. Dynamic structures, Static structures

C. Liner structures, Non-liner structures

D. Simple structures, Complex structures

8. In the following data-structures, ( ) is liner structure.

A. DAG B. BST C. linked based Stack D. Heap

9. If the height of a Complete Binary Tree is n, then the number of node is at most ( ).

A. 2^n B. n C. 2^n-1 D. 2^{n-1}-1

10. When sorting the sequence {15，9，7，8，20，-1，4}, the middle result after one pass is: {9，15，7，8，20，-1，4}; Then the sort method used is ( ).

A. Insertion Sort B. Heap sort C. Quick sort D. Bubble Sort

11. A collision resolution technique that places all records directly into the hash table is called ( ).

A. Open hashing B. Separate chaining C. Closed hashing D. Probe function

12. A 2-3 tree is a specific variant of a ( ).

A. Splay tree B. B-tree C. BST D. Trie

13. Pick the growth rate that corresponds to the most efficient algorithm when n = 4. ( )

A. 5n B. 20 log n C. $2n^2$ D. 2^n

14. All operations on a stack can be implemented in constant time except ( ).

A. Push

B. Pop

C. The implementor's choice of push or pop (they cannot both be implemented in constant time).

D. None of the above.

15. Recursion is generally implemented using ( ).

A. A sorted list B. A stack C. A queue D. none of the above

二、名词解释题（本大题共 4 小题，1-3 题每小题 4 分，4 题 3 分，共 15 分）。提示：解释每小题所给名词的含义，若解释正确则给分，若解释错误则无分，若解释不准确或不全面，则酌情扣分。

1. queue

2. heap

3. doubly linked list

4. B+ tree

三、应用题（本大题共 5 小题，每小题 7 分，共 35 分）

提示：有求解过程的要尽量给出解题步骤，只有最终答案会酌情扣分。

1. Suppose you have a binary tree whose data fields are single characters. When the nodes are output in in-order, the output is DCEFBHGAKJLIM, and when they are output in post-order, the output is DFECHGBKLJMIA. Draw the binary tree showing the data in each node, and show the result when the nodes are output in pre-order.

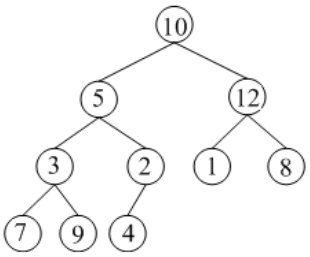
2. Starting from an empty binary tree, sequentially insert the following elements one by one according to the insertion algorithm of binary search tree: 23, 49, 28, 10, 30, 5, 16.

(a) Draw the binary search tree after inserting all the above elements.

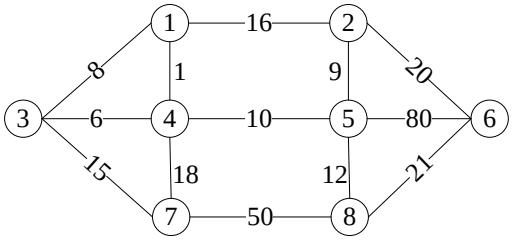
(b) Beginning at the root, search for a record with value 7 in the above BST. Before the search is over, which nodes will be compared with value 7?

3. Build a hash table of 19, 14, 23, 1, 68, 20, 84, 27, 55, 11, 10, 79, using hash function H(key) = key MOD 13. The collision resolution policy adopts open hashing, namely the collision results is stored in a certain slot's linked list. The size of hash table n = 13. Please show the process.

4. Is the following binary a max-heap? If not, please change it to a max-heap. Be sure to show the steps of building max-heap.



5. List the order in which the edges of the following graph are visited when running Prim's MST algorithm starting at Vertex 1. Show the MST.



四、编程、设计及分析题（本大题共 2 小题，每小题 10 分，共 20 分）。

提示：每小题给出了一个程序设计要求，请按照要求填空（每空只填一条语句或表达式）或写出源程序代码，如果源程序代码中出现语法错误或逻辑错误，则酌情扣分。

1. Suppose the input data are stored in a singly linked list with head node. The following is the **selection** sorting algorithm on linked list. The definition of linked node is like following:

```
typedef struct node{
    ElemType data; //  数据域
    struct node *link; //  指针域
    }node;
node *SelectSort(node *La)
{   node *p, *q, *r, *s;
    p = La;
    while ( p -> link != null ) {
        q = p -> link;    r = p;
        while (    (1)    ) {
            if (q -> link -> data < r -> link -> data )    r = q;
            q = q -> link;
            }
        if (    (2)    ) {
            s = r -> link;    r -> link = s -> link;
            s -> link =    (3)    ;
                (4)    ;
            }
            (5)    ;
        }
    return(La);
 }
```

(1)_____ (2)_____ (3)_____

(4)_____ (5)_____

2. Given two sorted linked list L1 and L2, write a function to compute L3 = L1∪L2. What is the running time of your algorithm?