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 ABC, if the output order is CBA, then the operation order of the stack is ( )

   (A) push, pop, push, pop, push, pop (B) push, push, push, pop, pop, pop

   (C) push, push, pop, pop, push, pop (D) push, pop, push, push, pop, pop

2. If the MaxSize of a Circular Queue is m, front points to the front element in the queue, and rear points to the rear element in the queue. The number of items in the Queue can be expressed by ( ).

   (A) (rear - front + m+1) % m (B) rear-front+1

   (C) (rear –front + m)% m (D) (rear - front) % m

3. In the worst case, the number of comparisons needed to search a single linked list of length n for a given element is ( )

   (A) log2n (B) n/2 (C) log2n – 1 (D) n

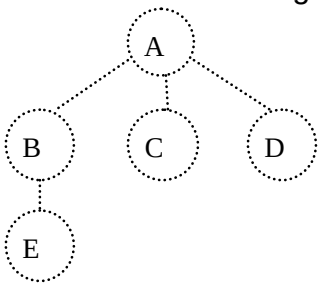
4. Encoding the string “alibaba” with Huffman code, how many bits will be used?( )

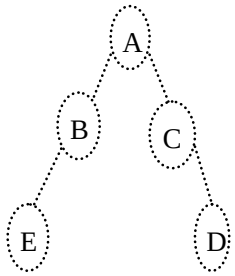
   (A) 11 (B) 12 (C) 13 (D) 14

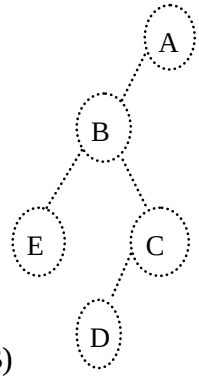
5. In the following sorting methods, the average time complexity of ( ) is O(N*log2N).

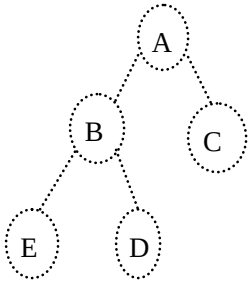
   (A) Quick sort (B) Bubble sort (C) Insertion sort (D) Selection sort

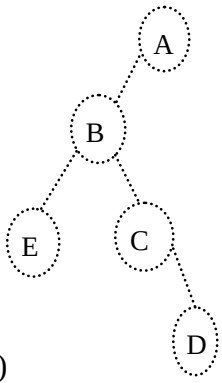
6. Which Binary Tree is reconstructed from the following General Tree ( )



(A)


(B)


(C)


(D)


7. The smallest number of key that will force a B-tree of order 3 to have a height 3 is ( )

(A) 12 (B) 10 (C) 7 (D) None of the above

8. A good hash function will ( ).
(A) Use the high-order bits of the key value. (B) Use the middle bits of the key value.
(C) Use the low-order bits of the key value. (D) Make use of all bits in the key value.

9. Data structure used by Prim's method is ( )
(A) Linked list (B) Stack (C) Priority Queue (D) None

10. The below are some properties of an algorithm except ( )
(A) same Input gets different output (B) done with finite steps
(C) composed of concrete steps (D) unambiguous

11. In the following data-structures, ( ) is liner structure.
(A) DAG (B) BST (C) linked based Stack (D) Heap

12. The result from scanning a Binary Search Tree in in-order traversal is in ( ) order.
(A) descending or ascending (B) descending
(C) ascending (D) out of order

13. In the following sequence, ( ) is a heap?
(A) 95, 65, 35, 15, 25, 45, 20, 10 (B) 95, 65, 35, 10, 30, 25, 20, 15
(C) 95, 45, 65, 35, 15, 20, 25, 10 (D) 10, 15, 20, 95, 45, 65, 35, 25

14. 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

15. If a node is at position r in the array implementation for a complete binary tree, then its right child is at ( )
(A) 2r + 1 if (2r + 1) < n (B) 2r + 2 if (2r + 2) < n
(C) r - 1 if r is even (D) r + 1 if r is odd

二、名词解释题（本大题共 4 小题，每小题 4 分，共 16 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. hash table
2. topological sort
3. worst case
4. FIFO

三、应用题（本大题共 4 小题，1-2 每小题 8 分，3-4 每小题 9 分，共 34 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.

(a) Show the BST that results from inserting the values 18, 22, 20, 12, 15, 18, 8, 13, and 17 (in that order).

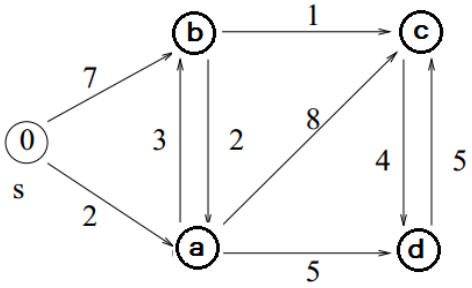
(b) Show the enumerations for the tree of (a) that result from doing a preorder traversal and a postorder traversal.

(c)Draw the BST that results from deleting the value 12 from the BST of (a).

2. Given values 6, 9, 2, 11, 4, 10, 8, 1, 5, 3, 7, 12, select first value 6 as pivot, write the Quicksort partition steps for pivot 6.

3. Assume that you have a 13 slots closed hash table (the slots are numbered 0 through 12). Show the final hash table that would result if you used the hash function h(k) = k mod 13 and pseudo-random probing on this list of numbers: 23, 12, 36, 27, 94, 64, 75. The permutation of offsets to be used by the pseudo-random probing will be: 5, 9, 2, 1, 4, 10, 8, 11, 6, 3, 7, 12.

4. Show the shortest paths generated by running Dijkstra's shortest-paths algorithm on the following graph, beginning at Vertex 0. Show the D values as each vertex is processed.



四、编程、设计及分析题（本大题共 2 小题，1 小题 8 分，2 小题 12 分，共 20 分）。

提示：请按照要求写出源程序代码，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. Swap all nodes' left child and right child of a binary tree. Use the following node structure.

```
typedef struct node {int data; struct node *lchild,*rchild;} bitree;
```

2. An expression includes '{', '}', '[', ']', '(', ')', write a program to judge whether the brackets match.