中山大学软件学院软件工程专业 **2009** 级 (2010 学年秋季学期)

《SE-211 数据结构与算法》 期末试题 (B 卷)

(考试形式：闭 卷 考试时间：2 小时)

警告

《中山大学授予学士学位工作细则》第六条

考试作弊不授予学士学位

方向：_____ 姓名：_____ 学号：_____

说明：一律在答题纸解答，第一题按下表格式。交卷时试题和答题纸一起交。

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

I、 Selection(with only one choice)（15%）

1. In data structure, which of the following structure of data is not related to computers（与所使用的计算机无关）.

   A) storage structure B) physical structure

   C) logical structure D) physical and storage structure

2. The computer algorithm refers to( )

   A) calculating approach

   B) sorting approach

   C) scheduling approach

   D) Finite sequences of operations for problem solving

3. When we talk about the data in computer memory, ( ) is a kind of structure whose physical address and logical address are the same and contiguous(物理地址与逻辑地址相同并且是连续的).

   A) storage structure

   B) logical structure

   C) contiguous storage structure

   D) linked storage structure

4. Given a stack *s* with the input sequence: 1,2, ..., n, and the output sequence: $p_1,p_2,\ldots,p_n$, if $p_1=n$，then p_i = ( ).

   A)i B)n-i C)n-i+1 D)uncertainty

5. Suppose there is a two-dimension array *a[1 .. 60,1 .. 70]* with 60 rows and 70 columns ,whose main order is the column order(以列序为主序). If the base address is 10000 and each element occupies two storage unit, then the storage address of *a[32,58]* is ( ). (无第 0 行第 0 列元素)

   A)14454 B)16904 C)16902 D) None of above

6. Let A be a $n \times n$ symmetric matrix（对称矩阵）. In order to save memory, its lower triangular is（下三角）stored in a one-dimensional array $B[1..n(n+1)/2]$ by row. The subscript position(下标) k of any element $a_{ij(i \geq j)}$ in lower triangular is（对下三角部分中任一元素 aij(i≥j)在一维数组 B 的下标位置 k 值是）( )

A)i(i-1)/2+j-1 B)i(i-1)/2+j C)i(i+1)/2+j-1 D)i(i+1)/2+j

B

7. Given two strings A and B, the operation to search the first position of B in A is called( )

A) connection B) pattern matching C) substring searching D) string length calculating

8. The post-order and the in-order sequences of a binary tree are *dabec* and *debac*. The preorder is( ).

A)acbed B)cedba C)decab D)deabc

C

9. Use an adjacency table(邻接表) to represent an directed graph including n vertices and e edges, the time complexity of deleting all edges associated with a vertex is( )

A)O(n) B)O(e) C)O(n+e) D)O(n*e)

B

10. How many minimum spanning trees does an undirected graph has? ( )

A) more than one

B) one or more

C) only one

D) maybe not exist

11. Determining whether there is a loop in a directed graph, we can use topology sorting as well as ( )

A) searching method for the critical path(求关键路径方法)

B) Dijkstra's shortest path method

C) breadth-first traversal method

D) depth-first traversal method

12. Using the breadth-first algorithm to traverse the graph represented by an adjacency table, we should use the data structure named ( ) to implement it.

A)stack B)queue C)tree D)graph

13. Using the depth-first algorithm to traverse the graph represented by an adjacency table, we should use the data structure named ( ) to implement it.

A)stack B)queue C)tree D)graph

14. If there exists a mapping relationship between the memory address of a node and the keyword(结点的存储地址与其关键字之间存在某种映射关系), we called the storage

structure ( )

A) scatter(Hash) storage structure

B) linked storage structure

C) index storage structure

D) contiguous storage structure

15. Sorting the sequence (25,84,21,47,15,27,68,35,20) , the sequence changes are (20,15,21,25,47,27,68,35,84)，(15,20,21,25,35,27,47,68,84)，(15,20,21,25,27,35,47,68,84). Which kind of sorting algorithm we used ? ( )

A) Selection sort B) shell sort C) merge sort D) quick sort

II、 Blank Filling（15%）

16. The time complexity of "i=1; while(i<=n) i=i*2;" is_____.

17. The time complexity of access any node in the contiguous list(顺序表) is_____, so we called the contiguous list the _____ data structure.

18. If there exist a complete binary tree（完全二叉树） including 768 nodes, then the number of the leaf node is_____.

19. If there exist a k-way tree（K 叉树） including *n* nodes, the maximum possible depth is_____,the minimum depth is_____

20. _____and_____are both commonly used storage structure for graphs. To traverse a graph, we usually use the following two methods: _____ and _____

21. In order to merge two ordered sequences with length m into a new ordered sequence, we need at least_____times of key comparing, and at most _____ times of key comparing.

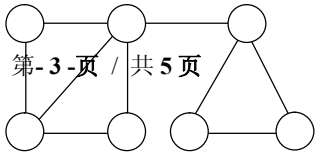
22. Suppose a directed graph *G* including a set of vertex {*v1, v2, v3, v4, v5*}, and a set of edges {<*v1,v2*>, <*v2,v4*>, <*v3,v5*>, <*v1,v3*>, <*v1,v5*>, <*v2, v3*>, <*v3, v4*>, <*v4, v5*>}, the node which has the greatest in-degree(入度) is_____. The node which has the greatest out-degree (出度) is_____, the result of topological sorting of *G* is_____

III、 Questions and Answers (36%)

23. Given an empty binary tree, please insert *e, b, d, f, a, g, c* in sequence, by the lexicographical order(字典序), according to the insertion algorithm of binary search tree. Draw each step for constructing a binary search tree.(9%)

24. Assuming the message used for communication is composed of only C1 ~ C8 letters（用于通信的电文仅由 C1～C8 字母组成）, the frequency of each letter appearing in the message is 0.07, 0.19, 0.02, 0.06, 0.32, 0.03, 0.21, 0.10. Design the **Huffman coding** for these 8 letters ， and represent it with another equal length binary encoding method from 0 to 7（试为这 8 个字母设计哈夫曼编码，并用另一种 0～7 的二进制等长编码方案表示）.In this example, compare the advantages and disadvantages of these two methods. (9%)

25. Given a graph *G*, see figure 1. (9%)



1) Try to find out the Minimum spanning tree（最小生成树）, and draw the logical structural graph（逻辑结构图）.
2) Show the Storage for graph G, with two different representations (hint: use adjacency matrix and adjacency table).

26. In the following sequence of keys, insert the keys, in the order shown, to build them into an AVL tree. Please draw the illustration figures for the whole procedure. (9%)

IV、 Programming(34%)

27. Reverse(逆转) List: Design an algorithm to reserve a list *L*. You are given : (10%)

（1） The head of *L: Linklist * L*;

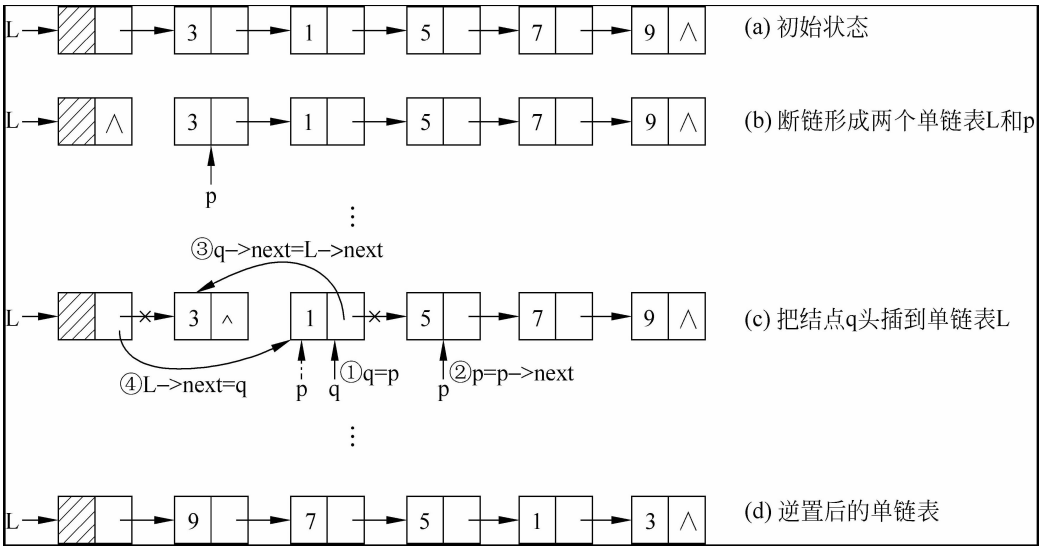
（2） The declaration of list-node:

```
template<class Entry>
struct Linklist{
    Entry data;
    Linklist * next;
};
```

（3） Declaration of proto function: ***void reverse(Linklist *L)***

Node: Do not create new node for the reversed list when reversing.

Hint: The illustration figures for the whole procedure is as following:



28. Write a function ***void selectionSort(int A[], int n)*** to implement a selection sort algorithm. The array ***A[]*** contains the integers to sort, and ***n*** denotes the size of ***A[]*** (10%)

29. Write a non-recursive（非递归） algorithm to traverse a binary tree by pre-order（前序）
The declaration of binary tree and tree node are given as following:

```
template <class Entry>
```

```
class Binary_tree {
public:
    Binary_tree();
    void preorder(void(*visit)(Entry &));
protected:
    Binary_node<Entry> * root;
};
template <class Entry>
struct Binary_node{
    Entry data;
    Binary_node<Entry> * left;
    Binary_node<Entry>* right;
    Binary_node();
    Binary_node(const Entry &x);
};
```

You are wanted to implement the function: *void preorder(void(*visit)(Entry &))* . (14%)