

浙江大学 2006 - 2007 学年秋季学期

《数据结构基础》课程期末考试试卷

开课学院： 软件学院、计算机学院、竺可桢学院 ， 考试形式： 闭卷， 允许带 无 入场

考试时间： 2006 年 11 月 11 日， 所需时间： 120 分钟

考生姓名： _____ 学号： _____ 专业： _____ 教师： _____

题序	一	二	三	四	总 分
得分					
评卷人					

NOTE: Please write your answers on the answer sheet.

注意： 请将答案填写在答题纸上。

I. Please select the answer for the following problems. (20 points)

- (1) Suppose that n numbers are pushed onto a stack in the order $1, 2, \dots, n-1, n$. If n is the first number that is popped out of the stack, then the i -th number popped must be _____ (2 points)
a. i b. $n-i+1$ c. $n-i$ d. any one is possible
- (2) The property(s) that a list does NOT have is(are) _____ (2 points)
a. no need to pre-estimate the total space
b. no need to move items for insertion and deletion
c. quick random access
d. the space taken is proportional to the length of the list
- (3) In the following integer sequences, _____ is(are) NOT a heap. (2 points)
a. (100,85,98,77,80,60,82,40,20,10,66)
b. (100,98,85,82,80,77,66,60,40,20,10)
c. (10,20,40,60,66,77,80,82,85,98,100)
d. (100,85,40,77,80,60,66,98,82,10,20)
- (4) If depth-first search can visit every vertex with any starting vertex, then that graph must be a _____. (2 points)
a. tree b. graph contains cycles c. complete graph d. connected graph
- (5) Given an integer sequence $\{15, 9, 7, 8, 20, -1, 4, \dots\}$. If after the first run of Shellsort, the sequence becomes $\{15, -1, 4, 8, 20, 9, 7\}$, then the increment must be ____ (2 points)
a. 1 b. 2 c. 3 d. 4

- (6) Place m items in a hash table with an array size of s , the loading factor is _____. (2 points)
 a. $s + m$ b. m / s c. $m * s$ d. $m - s$
- (7) Breath-first search with the adjacency list representation of a graph is similar to the _____ traversal of a binary tree (2 points)
 a. preorder b. inorder c. postorder d. level-order
- (8) Among the following sorting algorithms, _____ has the average run time $O(N \log N)$ with small extra space. (2 points)
 a. Quick sort b. Heap sort c. Merge sort d. Radix sort
- (9) In a _____, keys along each of the paths from any node to the root are ordered. (2 points)
 a. heap b. binary search tree c. complete tree d. none of the above
- (10) If a complete binary tree of height h (≥ 0) is represented by an array, then the index of the left most leaf is _____. (2 points)
 a. $2^{h-1} + 1$ b. 2^h c. $2^{h+1} - 1$ d. 2^{h+1}

II. Given the function descriptions of the following two (pseudo-code) programs, please fill in the blank lines. (24 points)

(1) The function is to determine the minimum paths from a start vertex to every other vertex in a weighted (all the weights are positive) graph, and to produce a count of the number of different minimum paths. (12 points)

```
void MinPathCount( Table T )
{ /* T[ ].Count is initialized to be 0. T[start].Count = 1 */
    vertex v, w;
    for ( ; ; ) {
        v = smallest unknown distance vertex;
        if ( v == NotAVertex )
            break;
        T[v].Known = True;
        for ( each w adjacent to v )
            if( !T[w].Known )
                if( ①_____ ) {
                    Decrease( T[w].Dist to T[v]+Cvw )
                    T[w].Path = v;
                    T[w].Count = ②_____ ;
                }
            else if(③_____ )
                T[w].Count += ④_____ ;
    }
}
```

(2) The function is to percolate down a min heap. (12 points)

```
void PercolateDown( int n, PriorityQueue H )
{
    int i, Child;
    ElementType LastElement;

    LastElement = H->Elements[n];
    for ( i = n; ①_____ ; i = Child ) {
        Child = i * 2;
        if ( Child!=H->Size && ②_____ )
            Child++;
        if ( LastElement > H->Elements[ Child ] )
            ③_____ ;
        else break;
    }
    ④_____ = LastElement;
}
```

III. Please write or draw your answers for the following problems on the answer sheet. (45 points)

(1) The followings are the partial results of a binary tree's traversals in pre-order, in-order and post-order. Please draw the corresponding tree. (11 points)

Pre-order : _B_F_ICEH_G

In-order: D_KFIA_EJC_

Post-order: _K_FBHJ_G_A

(2) For the graph given by the adjacency matrix
$$\begin{bmatrix} 0 & 7 & 0 & 0 & 0 & 0 \\ 7 & 0 & 5 & 1 & 0 & 0 \\ 0 & 5 & 0 & 4 & 0 & 2 \\ 0 & 1 & 4 & 0 & 3 & 6 \\ 0 & 0 & 0 & 3 & 0 & 0 \\ 0 & 0 & 2 & 6 & 0 & 0 \end{bmatrix}$$
, obtain:

- (a) its biconnected components (6 points)
- (b) the minimum cost spanning tree. (6 points)

(3) Insert the keys: 11, 5, 29, 20, 0, 27 and 18 into a hash table with linear open addressing and a size of 9. Use the hash function "k%9". Please draw the resulting table. (14 points)

(4) To sort an integer sequence { 3, 87, 12, 61, 70, 97, 26, 45 } using Heapsort. Please fill in the blanks. (8 points)

The initial heap structure after building the heap: _____

The sorting progress:

- (1) 87 70 26 61 45 12 3 97; (2) _____;
- (3) 61 45 26 3 12 70 87 97; (4) _____;
- (5) 26 12 3 45 61 70 87 97; (6) _____;
- (7) 3 12 26 45 61 70 87 97.

IV. Please describe a non-recursive algorithm that return one of the most far away leaf from root in a binary tree. (11 points)

```
struct TreeNode {  
    ElementType Element;  
    TreeNode *left;  
    TreeNode *right;  
}  
  
TreeNode *FarLeaf (TreeNode *tree)
```

Answer Sheet

Part I				
1.	2.	3.	4.	5.
6.	7.	8.	9.	10.
Part II				
1. ① _____ ② _____ ③ _____ ④ _____		2. ① _____ ② _____ ③ _____ ④ _____		
Part III				
1.		2. (a) (b)		
3.		4. Initial heap: _____ (2) _____ (4) _____ (6) _____		

Part IV

```
TreeNode *FarLeaf(TreeNode *tree)
```