

浙江大学 2003 —2004 学年第 1 学期期末考试

《数据结构与算法》课程试卷

考试时间： 120 分钟 开课学院 计算机 专业

姓名 学号 任课教师

题序	一	二	三	四	五	六	总分
评分							
评阅人							

1. Please fill in the blanks with your choices: (35 points)

(1) Given a string of expression, $3 * a + b / c$. Please use a stack to re-order the expression into $3 a * b c / +$. Here let P stand for “push” and “O” for “pop”. For example, ABC is re-ordered into BCA by PPOPOO. The sequence of stack operations is (7 points)

(2) A circular queue is represented by an array with m elements. If only the *front* pointer is defined, and the *rear* is replaced by a counter which counts the current number of elements in the queue, then the maximum number of elements that can possibly be pushed into the queue is . (2 points)

① m ; ② $m - 1$; ③ $m + 1$; ④ Cannot be determined

(3) Given a tree with n_1 nodes of degree 1, n_2 nodes of degree 2, \dots , n_m nodes of degree m . The number of leaf nodes this tree have is (2 points)

① $\sum_{i=2}^m (i+1)n_i$; ② $\sum_{i=1}^m (n_i - 1)$; ③ $1 + \sum_{i=2}^m (i-1)n_i$; ④ $\sum_{i=2}^m (i-1)n_i - 1$

(4) Given the preorder traversal sequence ABDCEFHG and the inorder traversal sequence BDAFHEGC, the corresponding postorder traversal sequence is . (4 points)

① DBAHFGCE; ② BDHFGECA; ③ DBHFGECA; ④ DBCFHEGA

(5) Which of the following methods are for solving collisions in a hash table? Answer: (4 points)

① linear probing; ② binary search; ③ key mod prime; ④ separate chaining.

(6) Given a segment of text “this_is_an_ideal_string”, bits are required to store the string as 1-byte characters, and bits are need to store its Huffman code. (6 points)

① 184; ② 152; ③ 103; ④ 98; ⑤ 79.

(7) A set of points on the x-axis determines a set of distances between every pair of points. Given a distance set $D = \{ 1, 2, 3, 4, 5, 7, 8, 9, 10 \}$ and assume that the left most point is located at the origin (i.e. $x_1 = 0$). Then the set must correspond to points. The point set is $P = \{ \text{ } \}$ (6 points)

(8) To test if there is a cycle in a given digraph, method(s) can be used. (4 points)

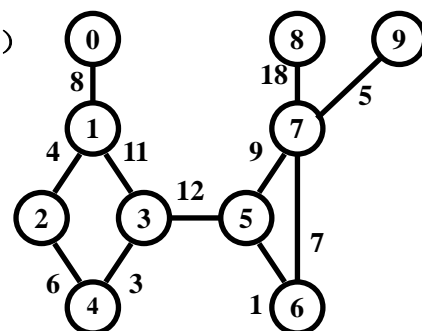
① Dijkstra ② Kruskal ③ Topological Sort ④ Critical Path

2. Show the optimal binary search tree for the following words, where the frequency of occurrence is in parentheses: *a* (0.18), *and* (0.19), *I* (0.23), *it* (0.21), *or* (0.19). (5 points)

3. Show the result of inserting $\{ 40, 30, 20, 50, 60, 45, 25, 55, 35, 38 \}$ into
(1) an initially empty AVL tree; (2) an initially empty 2-3 tree. (8 points)

4. For the graph given by the figure, obtain: (27 points)

- (1) its adjacency matrix (3 points)
- (2) its adjacency list representation (3 points)
- (3) its articulation points (6 points)
- (4) its biconnected components (6 points)
- (5) the minimum cost spanning tree. (9 points)



5. Please read the following two programs and fill in the blank lines of code. (12 points)

(1) The function is to insert an element X into a min heap.

```
/* H->Element[ 0 ] is a sentinel */
void Insert( ElementType X, PriorityQueue H )
{   int i;
    if( IsFull( H ) ) {
        Error( "Priority queue is full" );
        return;
    }
    for( i = ++H->Size; _____; i /= 2 )
        H->Elements[ i ] = H->Elements[ i / 2 ];
    _____;
}
```

(2) The function is to push an element X onto a stack S.

```
void Push( ElementType X, Stack S )
{   PtrToNode TmpCell;
    TmpCell = malloc( sizeof( struct Node ) );
    if( TmpCell == NULL )
        FatalError( "Out of space!!!" );
    else {
        TmpCell->Element = X;
        _____;
        _____;
    }
}
```

6. Please write a **recursive** C program that counts the number of leaf nodes in a binary tree. The input is a binary tree and the output is the number of leaf nodes in that tree. (13 points)