总分: 91 / 100

判断题   总分: 30 / 39

1-1   答案正确 得分: 3 / 3

For one operation, if its worst-case time bound is $\Theta(\log N)$, then its amortized time bound must be $O(\log N)$. (3分)

⦿ T   ○ F

1-2   答案错误 得分: 0 / 3

With the same operations, the resulting leftist heap is always more balanced than the skew heap. (3分)

⦿ T   ○ F

1-3   答案错误 得分: 0 / 3

To solve a problem by dynamic programming instead of recursions, the key approach is to store the results of computations for the subproblems so that we only have to compute each different subproblem once. Those solutions can be stored in an array or a hash table. (3分)

○ T   ⦿ F

1-4   答案正确 得分: 3 / 3

In a B+ tree, leaves and nonleaf nodes have some key values in common. (3分)

⦿ T   ○ F

1-5   答案正确 得分: 3 / 3

Word stemming is to eliminate the commonly used words from the original documents. (3分)

○ T   ⦿ F

1-6   答案正确 得分: 4 / 4

In a red-black tree, an internal red node cannot be a node of degree 1. (4分)

⦿ T   ○ F

1-7   答案正确 得分: 3 / 3

All of the Zig, Zig-zig, and Zig-zag rotations not only move the accessed node to the root, but also roughly half the depth of most nodes on the path. (3分)

⦿ T   ○ F

1-8   答案错误 得分: 0 / 3

While accessing a term, hashing is faster than search trees. (3分)

○ T   ⦿ F

1-9   答案正确 得分: 5 / 5

For the recurrence equation $T(N) = aT(N/b) + f(N)$, if $af(N/b) = Kf(N)$ for some constant $K > 1$, then $T(N) = \Theta(f(N))$. (5分)

○ T   ◉ F

1-10   答案正确 得分: 4 / 4

In the 4-queens problem, (x^1, x^2, x^3, x^4) correspond to the 4 queens' column indices. During backtracking, (1, 3, 4, ?) will be checked before (1, 4, 2, ?), and none of them has any solution in their branches. (4分)

◉ T   ○ F

1-11   答案正确 得分: 5 / 5

Insert { 1, 2, 5, 3, 8, 4, -7, 10, 88, 34, 15, 63, 18, -18, 96 } into an initially empty binomial queue, the resulting roots are 96, -18, -7 and 1. (5分)

○ T   ◉ F

选择题   总分: 36 / 36

2-1   答案正确 得分: 6 / 6

Among the following groups of concepts, which group is not totally relevant to a search engine? (6分)

○ A. word stemming, compression, recall
○ B. distributed index, hashing, inverted file index
○ C. stop words, posting list, dynamic indexing
◉ D. thresholding, dynamic programming, precision

2-2   答案正确 得分: 6 / 6

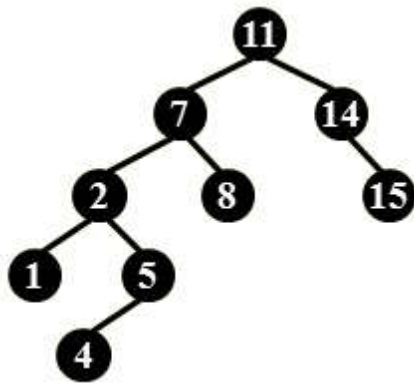Delete the minimum number from the given leftist heap. Which one of the following statements is TRUE? (6分)
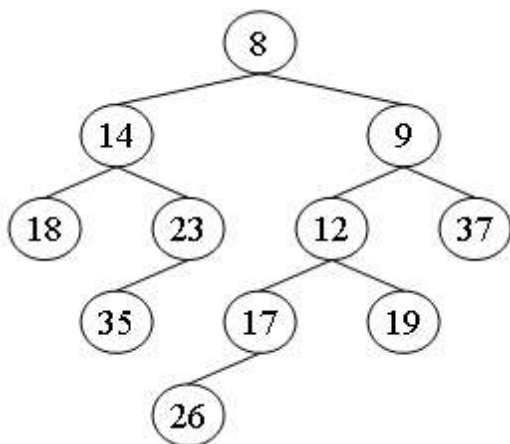
○ A. 12 is the right child of 9
◉ B. 23 is the left child of 14
○ C. 9 is NOT the root
○ D. 37 is the left child of 23

2-3   答案正确 得分: 6 / 6

For the result of accessing the keys 5 and 8 in order in the splay tree in the following figure, which one of the following statements is FALSE? (6分)

- ○ A. 5 is the parent of 7
- ○ B. 2 and 7 are siblings
- ○ C. 8 is the root
- ◉ D. 11 is the parent of 7

2-4   答案正确 得分: 6 / 6

When solving a problem with input size N by divide and conquer, if at each step, the problem is divided into 4 sub-problems and each size of these sub-problems is $N/2$, and they are conquered in $O(N^2 \log N)$. Which one of the following is the closest to the overall time complexity? (6分)

- ○ A. $O(N_2^2 \log N)$
- ○ B. $O(N_3^2)$
- ○ C. $O(N_2^3 \log N)$
- ◉ D. $O(N^2 \log^2 N)$

2-5   答案正确 得分: 6 / 6

A B+ tree of order 3 with 21 numbers has at most __ nodes of degree 3. (6分)

- ◉ A. 4
- ○ B. 1
- ○ C. 3
- ○ D. 2

2-6   答案正确 得分: 6 / 6

Insert {7, 8, 9, 2, 3, 5, 6, 4} into an initially empty AVL tree. Which one of the following statements is FALSE? (6分)

- ○ A. there are 2 nodes with their balance factors being -1
- ○ B. 2 and 5 are siblings
- ○ C. 7 is the root
- ◉ D. 3 is the parent of 4

程序填空题

总分: 25 / 25

5-1   答案正确 得分: 15 / 15

The function `RL_Rotation` is to do right-left rotation to the trouble-finder tree node `T` in an AVL tree.

```
typedef struct TNode *Tree;
struct TNode {
    int key, h;
    Tree left, right;
};

Tree RL_Rotation( Tree T )
{
    Tree K1, K2;

    K1 = T->right;
    K2 = K1->left;
    K1->left = K2->right          (15分);
    T->right = K2->left           ;
    K2->right = K1;
    K2->left=T                    ;
    /* Update the heights */
    K1->h = maxh(Height(K1->left), Height(K1->right)) + 1;
    T->h = maxh(Height(T->left), Height(T->right)) + 1;
    K2->h = maxh(K1->h, T->h) + 1;

    return K2;
}
```

分数组成	结果	得分
1	答案正确	5
2	答案正确	5
3	答案正确	5

5-2   答案正确 得分: 10 / 10

The function `BinQueue_Merge` is to merge two binomial queues `H1` and `H2`, and return `H1` as the resulting queue.

```
BinQueue BinQueue_Merge( BinQueue H1, BinQueue H2 )
{   BinTree T1, T2, Carry = NULL;
    int i, j;
    H1->CurrentSize += H2-> CurrentSize;
    for ( i=0, j=1; j<= H1->CurrentSize; i++, j*=2 ) {
        T1 = H1->TheTrees[i]; T2 = H2->TheTrees[i];
        switch( 4*!!Carry + 2*!!T2 + !!T1 ) {
        case 0:
        case 1: break;
        case 2: H1->TheTrees[i] = T2; H2->TheTrees[i] = NULL; break;
        case 3: Carry = CombineTrees( T1, T2 );
```

```
                H1->TheTrees[i] = H2->TheTrees[i] = NULL; break;
        case 4: H1->TheTrees[i] = Carr(10分); break;
        case 6: Carry = CombineTrees( T2, Carry );
                H2->TheTrees[i] = NULL; break;
        case 5: Carry = CombineTrees( ;
                H1->TheTrees[i] = NULL; break;
        case 7: H1->TheTrees[i] = Carry;
                Carry = CombineTrees( T1, T2 );
                H2->TheTrees[i] = NULL; break;
        } /* end switch */
    } /* end for-loop */
    return H1;
}
```

分数组成	结果	得分
1	答案正确	5
2	答案正确	5