1-1 In an AVL tree, it is impossible to have this situation that the balance factors of a node and both of its children are all +1. (2分)

○ T    ● F

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1-1 答案正确    (2 分)    💡 创建提问

1-2 In amortized analysis, a good potential function should always assume its maximum at the start of the sequence. (1分)

○ T    ● F

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1-2 答案正确    (1 分)    💡 创建提问

1-3 The Huffman code is one kind of optimal prefix codes. For a given alphabet and its characters' frequencies，the Huffman codes may not be unique, but the Huffman code **length** of each character is unique. (2分)

○ T    ● F

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1-3 答案正确    (2 分)    💡 创建提问

1-4 When measuring the relevancy of the answer set, if the precision is high but the recall is low, it means that most of the relevant documents are retrieved, but too many irrelevant documents are returned as well. (2分)

○ T    ● F

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1-4 答案正确    (2 分)    💡 创建提问

1-5 Making $N$ insertions into an initally empty binomial queue takes $\Theta(NlogN)$ time in the worst case. (1分)

○ T    ● F

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1-5 答案正确    (1 分)    💡 创建提问

1-6 The root of a B+ tree of order $m$ has at most $m$ subtrees. (1分)

● T    ○ F

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1-6 答案正确    (1 分)    💡 创建提问

1-7 For the recurrence equation $T(N) = aT(N/b) + f(N)$, if $af(N/b) = f(N)$, then $T(N) = \Theta(Nlog_b N)$. (2分)

○ T    ● F

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1-7 答案正确    (2 分)    💡 创建提问

2-1 When doing amortized analysis, which one of the following statements is FALSE? (2分)

　　○ A. Aggregate analysis shows that for all $n$, a sequence of $n$ operations takes worst-case time $T(n)$ in total. Then the amortized cost per operation is therefore $T(n)/n$

　　◉ B. For potential method, a good potential function should always assume its maximum at the start of the sequence

　　○ C. For accounting method, when an operation's amortized cost exceeds its actual cost, we save the difference as credit to pay for later operations whose amortized cost is less than their actual cost

　　○ D. The difference between aggregate analysis and accounting method is that the later one assumes that the amortized costs of the operations may differ from each other

2-1 答案正确　(2 分)　♡ 创建提问

作者　陈越
单位　浙江大学

2-2 Given 4 cases of frequences of four characters. In which case(s) that the total bits taken by Huffman codes are the same as that of the ordinary equal length codes? (3分)

　　• (1) 1 2 2 3
　　• (2) 1 1 1 2
　　• (3) 2 2 3 5
　　• (4) 1 2 3 4

　　○ A. (1) and (2)
　　○ B. (3) only
　　○ C. (1), (2) and (4)
　　◉ D. (2) only

2-2 答案错误 ⓘ　(0 分)　♡ 创建提问

作者　陈越
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2-3 There are 8000 documents in the database. The statistic data for one query are shown in the following table. The recall is: __ (2分)

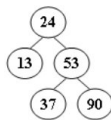|  | Relevant | Irrelevant |
|---|---|---|
| Retrieved | 1000 | 1000 |
| Not Retrieved | 2000 | 4000 |

　　○ A. 12.5%
　　○ B. 20%
　　◉ C. 33%
　　○ D. 50%

2-3 答案正确　(2 分)　♡ 创建提问

作者　杨欣豫
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2-4 Insert key 48 into the balanced binary tree shown by the figure. Then in the resulting balanced tree, the left- and right-child of key 37 are: (2分)
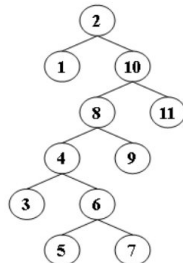


　　○ A. 13 and 48
　　○ B. 24 and 48
　　◉ C. 24 and 53
　　○ D. 24 and 90

2-4 答案正确　(2 分)　♡ 创建提问

作者　DS课程组
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2-5 For the result of accessing 5 in the splay tree in the following figure, besides saying that 5 must be the root, which one of the following statements is also TRUE? (2分)



　　○ A. 2 and 10 are siblings
　　○ B. 4 and 10 are siblings
　　◉ C. 6 and 10 are siblings
　　○ D. 6 is a leaf node

2-5 答案正确　(2 分)　♡ 创建提问

作者　陈越
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2-6 Insert {3, 9, 6, 7, 1, 4, 8, 10} into an initially empty 2-3 tree (with splitting), and then delete 7. Which one of the following statements is FALSE about the resulting tree? (2分)

　　○ A. 9 and 8 are in the same node
　　○ B. the parent of the node containing 6 has 3 children
　　○ C. the first key stored in the root is 4
　　◉ D. there are 4 leaf nodes

2-6 答案正确　(2 分)　♡ 创建提问

作者　陈越
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5-1 A binary tree is said to be "height balanced" if both its left and right subtrees are height balanced, and the heights of its left and right subtrees can differ by at most 1. That is, $|H_L - H_R| \leq 1$ where $H_L$ and $H_R$ are the heights of the left and right subtrees, respectively. An empty binary tree is defined to be height balanced.

The function `IsBalanced` is to judge if a given binary tree `T` is height balanced. If the answer is yes then return `true` and store the tree height in the parameter `pHeight`, else simply return `false`. The height of an empty tree is defined to be 0.

```
typedef struct TNode *BinTree;
struct TNode{
    int Key;
    BinTree Left;
    BinTree Right;
};

bool IsBalanced ( BinTree T, int *pHeight )
{
    int  LHeight, RHeight, diff;

    if( T == NULL) {
        *pHeight = 0;
        return true;
    }
    else if ( IsBalanced(T->Left, &LHeight) && IsBalanced(T->Right, &RHeight) ) {
        diff = LHeight - RHeight;
        if (  diff>=-1 && diff<=1     (3分) )  {
            *pHeight = 1 + ( diff<0 ?  LHeight:RHeight      (3分) );
            return true;
        }
        else return false;
    }
    return false;
}
```

5-1 部分正确 ⓘ (3 分)   💡 创建提问

5-2 The function `DeleteRoot` is to delete the root of a subtree with index `Ind` from a binomial queue `H`. The rest of the subtree is then stored as a new binomial queue and returned.

```
BinQueue DeleteRoot( BinQueue H, int Ind )
{
        BinTree OldRoot, SubTree;
        BinQueue NewBinQ;
        int i;

        OldRoot = H->TheTrees[Ind];
        SubTree = OldRoot->LeftChild;
        free(OldRoot);
        NewBinQ = Initialize();
        NewBinQ->CurrentSize =  (1<<Ind)-1          (3分);
        for (  i=Ind-1; i>=0; i--       (3分) ) {
                NewBinQ->TheTrees[i] = SubTree;
                SubTree = SubTree->NextSibling;
                NewBinQ->TheTrees[i]->NextSibling = NULL;
        }
        return NewBinQ;
}
```

5-2 答案正确   (6 分)   💡 创建提问