R1-1 分数 3 作者 叶德仕 单位 浙江大学

The solution to the recurrence $T(n) = T(n/6) + T(7n/9) + O(n)$ is $O(n)$. (Assume $T(n) = 1$ for $n$smaller than some constant c)

● T ○ F

答案正确：3 分

R1-2 分数 3 作者 陈越 单位 浙江大学

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.

○ T ● F

答案正确：3 分 创建提问

R1-3 分数 3 作者 陈越 单位 浙江大学

The time bound of the FIND operation in a B+ tree containing N numbers is $O(\log N)$, no matter what the degree of the tree is.

● T ○ F

答案正确：3 分 创建提问

R1-4 分数 3 作者 陈越 单位 浙江大学

In an AVL tree, it is possible to have this situation that the balance factors of a node and both of its children are all -1.

● T ○ F

答案正确：3 分 创建提问

R1-5 分数 3 作者 叶德仕 单位 浙江大学

In order to acces a node x in a splay tree with n nodes, we use the standard binary search tree algorithm to find x and then use the splay operation to move x to the root. The amortized cost of finding node x is $O(\log n)$.

● T ○ F

答案正确：3 分

R1-6 分数 3 作者 叶德仕 单位 浙江大学

Recall that the worst-case time complexities of insertions and deletions in a heap of size N are both $O(\log N)$. Then, without changing the data structure, the amortized time complexity of insertions in a heap is also $O(\log N)$, and that of deletions is $O(1)$.

● T ○ F

答案正确：3 分 创建提问

R1-7 分数 3 作者 叶德仕 单位 浙江大学

Stemming increases recall while harming precision。

● T ○ F

答案正确：3 分

R1-8 分数 3 作者 陈越 单位 浙江大学

The number of light nodes along the right path of a skew heap is $O(\log N)$.

○ T ● F

答案错误：0 分 创建提问

R1-9 分数 3 作者 yedeshi 单位 浙江大学

Is it true that a red-black tree Deletion operation requires $O(1)$ nodes recoloring in the worst case?

○ T ● F

答案正确：3 分

R1-10 分数 3 作者 叶德仕 单位 浙江大学

In the recursion of f the Floyd–Warshall algorithm for All-Pairs Shortest Path problem:

$$D^k[i][j] = \min \begin{cases} D^{k-1}[i][j] & \text{Case 1} \\ D^{k-1}[i][k] + D^{k-1}[k][j] & \text{Case 2} \end{cases}.$$

Is it ture that $D^k[i][j]$ represents the length of the shortest path from vertex i to vertex j that only uses vertex $\{1, 2, \ldots, k\}$ as intermediate nodes?

● T ○ F

答案正确：3 分

R2-1 分数 5 作者 何钦铭 单位 浙江大学

The potential function Q of a binomial queue is the number of the trees. After merging two binomial queues $H1$ with 22 nodes and $H2$ with 13 nodes，what is the potential change $Q(H1+H2)-(Q(H1)+Q(H2))$?

● A. -3

○ B. 2

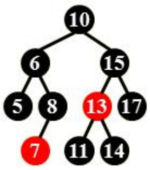
○ C. -2

○ D. 0

答案正确：5 分 创建提问

R2-2 分数 5 作者 徐镜春 单位 浙江大学

After deleting 10 from the red-black tree given in the figure, which one of the following statements must be FALSE?



○ A. 8 is the parent of 15, and 7 is black

○ B. 11 is the parent of 6, and 14 is red

● C. 8 is the parent of 15, and there are 2 red nodes in the tree

○ D. 11 is the parent of 15, and there are 2 red nodes in the tree

答案正确：5 分 创建提问

R2-3 分数 5 作者 叶德仕 单位 浙江大学

A queue can be implemented by using two stacks S_A and S_B as follows:

- To enqueue x, we push x onto S_A.
- To dequeue from the queue, we pop and return the top item from S_B. However, if S_B is empty, we first fill it (and empty S_A) by popping the top item from S_A, pushing this item onto S_B, and repeat until S_A is empty.

Assuming that push and pop operations take $O(1)$ worst-case time, please select a potential function ϕ which can help us prove that enqueue and dequeue operations take $O(1)$ amortized time (when starting from an empty queue).

○ A. $\phi=2|S_B|$

○ B. $\phi=|S_A|$

○ C. $\phi=|S_B|$

● D. $\phi=2|S_A|$

答案正确：5 分 创建提问

R2-4 分数 5 作者 叶德仕 单位 浙江大学

Which is not the element required for **Relevance measurement** of Search Engine?

● A. Recall is preferred over precision.

○ B. A binary assessment of either Relevant or Irrelevant for each query-doc pair.

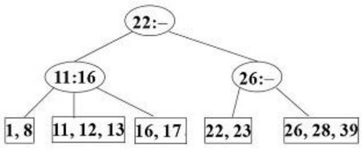
○ C. A benchmark suite of queries.

○ D. A benchmark document collection.

答案正确：5 分

R2-5 分数 5 作者 何钦铭 单位 浙江大学

Given a 2-3 tree as shown in the following figure. Which of the following pairs of insertions will result in a 2-3 tree with different structures?



○ A. Inserting 27 vs. inserting 30

○ B. Inserting 9 vs. inserting 24

● C. Inserting 14 vs. inserting 18

○ D. Inserting 18 vs. inserting 24

答案正确：5 分 创建提问

R2-6 分数 5 作者 陈越 单位 浙江大学

If the depth of an AVL tree is 5 (the depth of an empty tree is defined to be 0), then the minimum possible number of nodes in this tree is:

○ A. 64

○ B. 33

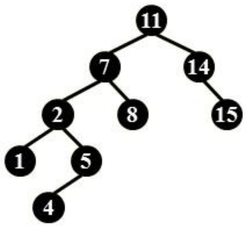
○ C. 20

● D. 12

答案正确：5 分 创建提问

R2-7 分数 5 作者 xjc 单位 浙江大学

For the result of accessing the keys 4, 8 in order in the splay tree in the following figure, which one of the following statements is FALSE?



)

○ A. 4 and 11 are siblings

● B. 7 and 14 are siblings

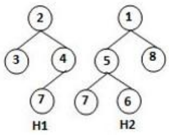
○ C. 8 is the root

○ D. 4 is the parent of 7

答案正确：5 分

R2-8 分数 5 作者 陈越 单位 浙江大学

Merge the two leftist heaps in the following figure. Which one of the following statements is FALSE?



○ A. 5 and 2 are siblings

○ B. 2 and 4 have the same NPL

○ C. 4 is the right child of 2

● D. along the right path from the root, we have 1, 5, and 6

答案错误：0 分 创建提问

R2-9 分数 5 作者 叶德仕 单位 浙江大学

For each of the following recurrences, choose the one that we cannot apply Master Theorems to solve it.

● A. $T(n) = 3T(n/3) + n/\lg n$

○ B. $T(n) = 4T(n/2) + n/\lg n$

○ C. $T(n) = 4T(n/2) + n^2 \lg n$

○ D. $T(n) = 3T(n/4) + n \lg n$

答案正确：5 分

R2-10 分数 5 作者 张国川 单位 浙江大学

Consider the following buffer management problem. Initially the buffer size (the number of blocks) is one. Each block can accommodate exactly one item. As soon as a new item arrives, check if there is an available block. If yes, put the item into the block, induced a cost of one. Otherwise, the buffer size is doubled, and then the item is able to put into. Moreover, the old items have to be moved into the new buffer so it costs $k+1$ to make this insertion, where k is the number of old items. Clearly, if there are N items, the worst-case cost for one insertion can be $\Omega(N)$. To show that the average cost is $O(1)$, let us turn to the amortized analysis. To simplify the problem, assume that the buffer is full after all the N items are placed. Which of the following potential functions works?

● A. The opposite number of available blocks in the buffer

○ B. The opposite number of items currently in the buffer

○ C. The number of items currently in the buffer

○ D. The number of available blocks currently in the buffer

答案正确：5 分 创建提问

R2-11 分数 5 作者 叶德仕 单位 浙江大学

In the knapsack problem, we have n items, in which the i-th item values v_i and sizes s_i, and a knapsack capacity C. (All positive integers.)
Our goal is to select a subset of the items such that the total value of the items should be as large as possible, and their total size should be at most C.
We will design dynamic programming to solve this problem. Please choose the correct description of subproblems of an optimal solution.

○ A. Let $OPT(i, v)$ denote the smallest size of a subset items $1, \ldots, i$ such that its value is exactly v, If no such item exists it is infinity.

○ B. None of above.

○ C. Let $OPT(i)$ denote the max total value of a subset of items $1, \ldots, i$.

● D. Let $OPT(i, C)$ denote the smallest total value of a subset of the first i items with total size at most C.

答案错误：0 分

▶ R5-1 LL Rotation 分数 8 作者 陈越 单位 浙江大学

The function `LL_Rotation` is to do left-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 LL_Rotation( Tree T )
{
    Tree L;

    L = T->left;
    T->left  4 分 = L->right;
    L->right = T;
    /* Update heights */
    T->h = maxh(Height(T->left), Height(T->right)) + 1;
    L->h = maxh(Height(T), Height(L->left)) + 1  4 分 ;

    return L;
}
```

答案正确：8 分 创建提问

R5-2 BinQueue_DeleteRoot 分数 7 作者 陈越 单位 浙江大学

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 = SubTree->CurrentSize  3 分 ;
    for ( i = 0; i < Ind; i++  4 分 ) {
        NewBinQ->TheTrees[i] = SubTree;
        SubTree = SubTree->NextSibling;
        NewBinQ->TheTrees[i]->NextSibling = NULL;
    }
    return NewBinQ;
}
```

多种错误：0 分 创建提问