四川大学期末考试试题（闭卷）

（2016~2017 学年第 1 学期） A 卷

课程号：311076040 课程名称：数据结构与算法 任课教师：________

适用专业年级：软件工程 2015 级 学号：________ 姓名：________

考生承诺

我已认真阅读并知晓《四川大学考场规则》和《四川大学本科学生考试违纪作弊处分规定（修订）》，郑重承诺：

1、 已按要求将考试禁止携带的文具用品或与考试有关的物品放置在指定地点；

2、 不带手机进入考场；

3、 考试期间遵守以上两项规定，若有违规行为，同意按照有关条款接受处理。

考生签名：

题号	一(30%)	二(16%)		三(34%)		四(20%)
得分						
卷面总分		教师签名		阅卷时间		

注意事项： 1. 请务必将本人所在学院、姓名、学号、任课教师姓名等信息准确填写在试题纸和添卷纸上；

2. **请将答案全部填写在答题纸上；本试题纸上的答案一律不计分；**

3. 考试结束，请将试题纸、添卷纸和草稿纸一并交给监考老师。

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评阅教师	得分

一、单项选择题（本大题共 15 小题，每小题 2 分，共 30 分）

提示：在每小题列出的四个备选项中只有一个是符合题目要求的，请将其代码写在答题纸上。错选、多选或未选均无分。

1. The time required to access and insert an element in an array-based list respectively is (　　)
   (A) O(n)　O(n)　(B) O(n)　O(1)　(C) O(1)　O(n)　(D) O(1)　O(1)
2. Given the input order of a stack is 1,2,3,4,5, (　　) is a possible valid output order.
   (A) 5 1 2 3 4　(B) 4 5 1 3 2　(C) 4 3 1 2 5　(D) 3 2 1 5 4
3. An algorithm must be or do all of the followings EXCEPT (　　)
   (A) correct　(B) composed of concrete steps
   (C) ambiguous　(D) composed of a finite number of steps
4. Assume the preorder of a binary tree T is EFHIGJK, the inorder is HFIEJKG, then the root of the right subtree in T will be (　　).
   (A) E　(B) F　(C) G　(D) H
5. In the following sorting algorithms, which has the highest space complexity? (　　)
   (A) Insertion Sort　(B) Bubble Sort　(C) Heapsort　(D) Mergesort
6. The most effective way to reduce the time required by a disk-based program is to (　　)
   (A) Improve the basic operations.　(B) Minimize the number of disk accesses.
   (C) Eliminate the recursive calls.　(D) Reduce main memory use.

7. The average time complexity for search operation in a binary search tree with n nodes is ( ).
   (A) $\Theta(1)$ (B) $\Theta(\log_2 n)$ (C) $\Theta(n)$ (D) $\Theta(n^2)$
8. Given an undirected graph G=(V,E), V={a,b,c,d,e,f} and E={(a,b),(a,e),(a,c),(b,e),(c,f),(f,d),(e,d)}, we traverse the nodes in the graph using a Depth-First Search(DFS) algorithm, then the possible traverse sequence is( ).
   (A) a,b,e,c,d,f (B) a,c,f,e,b,d (C) a,e,b,c,f,d (D) a,e,d,f,c,b
9. The correct traversal to use on a BST to visit the nodes in sorted order is ( ) traversal.
   (A) preorder (B) inorder (C) postorder (D) level order
10. We use the parent pointer representation for general trees to solve which problem? ( )
    (A) Shortest paths (B) General tree traversal
    (C) Equivalence classes (D) Exact-match query
11. The primary difference between a B-tree and a B+-tree is( )
    (A) The B+-tree store records only at the leaf nodes.
    (B) The B+-tree has a higher branching factor.
    (C) The B+-tree is hight balanced.
    (D) The B+-tree is smaller.
12. Dijkstra's algorithm requires that vertices be visited in( )
    (A) Depth-first order. (B) Breadth-first order.
    (C) Order of distance from the source vertex. (D) No particular order.
13. What is the best definition of a collision in a hash table? ( )
    (A) Two entries are identical except for their keys.
    (B) Two entries with different data have the exact same key.
    (C) Two entries with different keys have the same exact hash value.
    (D) Two entries with the exact same key have different hash values.
14. An arithmetic expression a*b-(c+d)/e can be changed to the postfix expression ( )
    (A) abc*d+e/- (B) ab*cd/+e- (C) ab*cd+e/- (D) ab*cde+/-
15. If a Huffman tree has 199 nodes, the Huffman tree has ( ) leaf nodes.
    (A) 99 (B) 100 (C) 101 (D) 102

评阅教师	得分

二、名词解释题（本大题共 4 小题，每小题 4 分，共 16 分）。

提示：解释每小题所给名词的含义，若解释正确则给分，若解释错误则无分，若解释不准确或不全面，则酌情扣分。

1. Huffman Tree
2. Equivalence Class
3. Binary Search Tree
4. Recursion

评阅教师	得分

三、应用题（本大题共 4 小题，1-2 每小题 8 分，3-4 每小题 9 分，共 34 分）

提示：有求解过程的要尽量给出解题步骤，只有最终答案会酌情扣分。

1. A 12 elements CBT is represented according Breadth-First traversal by the array [5, 10, 12, 8, 15, 6, 17, 2, 4, 7, 18, 3].

   1) Draw the complete binary tree. (2 points)

   2) Is this complete binary tree a max heap? If not, construct the max heap. (6 points)

2. Build the Huffman coding tree and determine the codes for the following set of letters and weights. (6 points)

Letter	A	B	C	D	E	F	G	H	I
Frequency	5	5	9	12	19	20	36	51	60

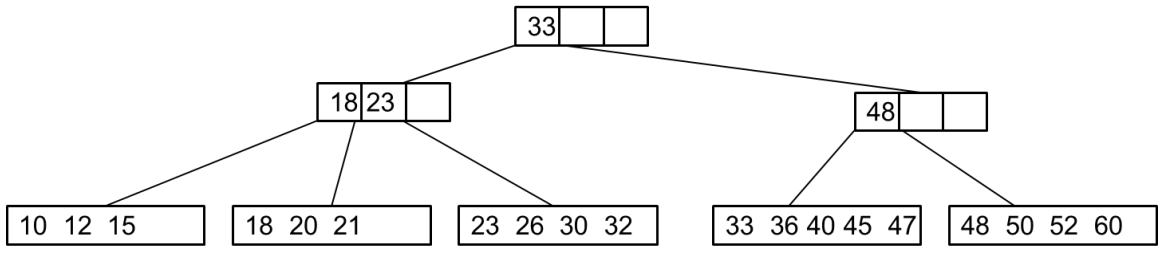
   What is the expected length in bits of a message containing n characters for this frequency distribution? (2 points)

3. Determine Θ for the following code fragments, and write out the analysis steps briefly.

   (1)
```
s=0;
for (i=0; i <= n; i++)
    for (j=0; j <= i; j++)
        for (k=0; k <= j; k++)
            s++;
```
   Determine Θ for this code fragments in the average case. (4 points)

   (2)
```
void f1(int n){
  for(int i= 0; i<n; i++)    f2(i);
  for(int i= 0; i<n; i++)
    for(int k=0; k<i; k++)
      printf("%d %d\n",i,k);
}
```
```
void f2(int m){
    int sum = 0;
    for(int i= 0; i<m; i++)    sum += i;
    printf("%d\n",sum);
}
```
   Assume that **printf** takes constant time. Determine Θ for function f1(n) in the average case. (5 points)

4. Insert 42, 51 and then delete 20 from the following B+ tree of order four. The leaf node can store at most 5 records.



评阅教师	得分

四、编程、设计及分析题（本大题共 2 小题，1 小题 8 分，2 小题 12 分，共 20 分）。

提示：每小题给出了一个程序设计要求，请按照要求写出源程序代码，如果源程序代码中出现语法错误或逻辑错误，则酌情扣分。

1. Assume there are two ascending ordered lists L1 and L2, please merge L1 and L2 into a new list L3. There will be no duplicate items in L3. Then please reverse the L3 into a descending ordered list.(8 points)
2. Please give the complete declaration of Queue in circle model, then write the **insert** algorithm and **delete** algorithm. (12 points)