四川大学期末考试试题（闭卷）

（2016~2017 学年第 1 学期） B 卷

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

适用专业年级：<u>软件工程 2015 级</u> 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<u>答题纸</u>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. Consider the following C++ code fragment.

```
x=0;
for(k=1; k<=n; k=k*2)
    for(j=1; j<=n; j++)
        x++;
```

What is its asymptotic time complexity? (　　)

(A) $\Theta(\log_2 n)$　　(B) $\Theta(n\log_2 n)$　　(C) $\Theta(n^2)$　　(D) $\Theta(n)$

2. Assign numbers to the node positions in a complete binary tree of 100 nodes, level by level, from left to right. If the index of the root is 1, then the index of the left child for the node indexed 49 will be (　　)

(A) 98　　(B) 99　　(C) 50　　(D) 48

3. Given a min-heap of 5,8,12,19,28,20,15,22, the final result of the min-heap after inserting 3 is (　　)

(A) 3,5,12,8,28,20,15,22,19　　(B) 3,5,12,19,20,15,22,8,28

(C) 3,8,12,5,30,15,22,28,19　　(D) 3,12,5,8,28,20,15,22,19

4. Sort the sequence (84, 47, 25, 15, 21) and the intermediate results of each pass are ordered as follows: (1) 84 47 25 15 21, (2) 15 47 25 84 21, (3) 15 21 25 84 47, (4) 15 21 25 47 84, then the sort method used is ( )
   (A) Selection Sort (B) Bubble Sort (C) Quick Sort (D) Insertion Sort
5. Sort an array of records using the Shell Sort algorithm. If the result after first pass is 9,1,4,13,7,8,20,23,15, then the increment of this pass is ( )
   (A) 2 (B) 3 (C) 4 (D) 5
6. In the modulus method for creating hash function, we map a key with value k into one of m slots by taking the remainder of k divided by m, then the hash function is ( )
   (A) h(k)=k mod m (B) h(k)=m mod k (C) h(k)=k mod k (D) none of these
7. Number of non-zero entries in the adjacency matrix of an undirected graph is ( )
   (A) |E| (B) 2|E| (C) |V| + |E| (D) None of these
8. The primary purpose of most computer programs is ( )
   (A) to perform a mathematical calculation.
   (B) to store and retrieve information.
   (C) to sort a collection of records.
   (D) all of the above.
9. Given a circular queue implemented with array A[0...m-1], if pointers front and rear point to the front and rear elements respectively, then the number of elements in the queue is ( ).
   (A) (rear-front+1+m)%m
   (B) rear-front+1
   (C) (rear-front+m)%m+1
   (D) (rear-front+m)%m
10. An input into a stack is like 1,2,3,4,5,6. Which output is impossible? ( )
    (A) 2,4,3,5,1,6 (B)3,2,5,6,4,1 (C)1,5,4,6,2,3 (D)4,5,3,6,2,1
11. The sorting algorithm used as a model for most external sorting algorithms is ( )
    (A) Insertion sort. (B) Quicksort. (C) Mergesort. (D) Radix Sort.
12. The basic unit of I/O when accessing a disk drive is( )
    (A) A byte. (B) A sector. (C) A cluster. (D) A track.
13. For a list of length n, the singly linked-list implementation's prev() function requires worst-case time is ( )
    (A) Θ(1). (B) Θ(log n). (C) Θ(n). (D) Θ(n^2).
14. The best data structure to check whether an arithmetic expression has balanced parentheses is ( )
    (A) queue (B) stack (C) tree (D) linked list
15. The height of a complete binary tree with n internal nodes is about ( )
    (A) $\log_2 n$ (B) nlogn (C) 2n (D) n

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。

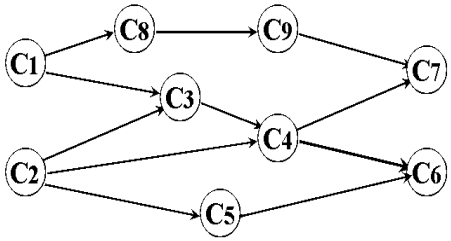
1. FIFO
2. Minimum Spanning Tree
3. Merge Sort
4. DAG

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. Given an array containing the elements {65, 2, 184 , 10, 148 , 55, 37, 253, 63, 16，158, 67}. Show how the order of the elements changes during the first pass of quicksort (choosing the first element of the array to be the pivot). Show the array before and after each swap.
2. Write out the topological sort result of the following graph by performing a DFS on the graph.



3. You are given a series of records whose keys are integers. The records arrive in the following order: 29, 79, 31, 16, 25, 27, 34, 52, 35. Show the 2-3 tree that results from inserting these records.
4. Build a hash table of 19, 43, 59, 76, 27, 06, 98, 33, 15, 31, using hash function H(key) = key MOD 13. Using double hashing solve collisions, and the second hash function is H2(key) = (7*key) MOD 11 + 1. The size of hush table n=13.

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. Please describe the binary link of a binary tree in C or C++ language. Write a function to count the number of leaves in a binary tree. (8 points)
2. Please give the Build-heap algorithm, please note the heap is stored in an array-based list. (12

points)