四川大学期末考试试题（闭卷）

（2018~2019 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 2017 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(34%)	三(20%)	四(16%)
得　　分				
卷面总分		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、答题纸和草稿纸一并交给监考老师。

评阅教师	得分

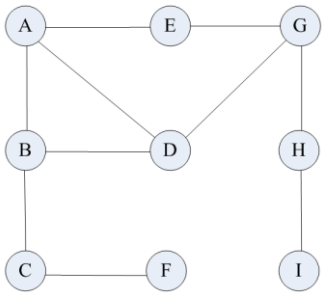
一、单项选择题（本大题共 15 小题，每小题 2 分，共 30 分）

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. If the MaxSize of a circular queue is 6, rear points to the 0th element and front points to the 3rd element in the queue. After removing two elements and inserting one element, rear and front point to the (　　) elements respectively.
   A. 1st and 5th
   B. 2nd and 4th
   C. 4th and 2nd
   D. 5th and 1st
2. The relationship between a full and a complete binary tree is (　　).
   A. Every complete binary tree is full.
   B. Every full binary tree is complete.
   C. None of the above.
   D. Both A and B
3. If pointer S points to the top of the stack (no header node) and T points to the bottom of the stack, then the operation of inserting a node with pointer R is (　　).
   A. T->next = R; T = R;
   B. R->next = S; S = R;
   C. S->next = R; S = R;
   D. R->next = t;

4. Given a non-empty BST, ( ) means that the node in the tree has the minimum value.
   A. Its pointer to the left child is empty.
   B. Its pointer to the right child is empty.
   C. Both pointers to the two children are empty.
   D. Both pointers to the two children are not empty.
5. We sort n records using Radix Sort algorithm. If the key has d digits and the base is r, then ( ) passes are required to sort these records.
   A. n
   B. d
   C. r
   D. n-d
6. In external sorting, a run is ( ).
   A. A sorted sub-section for a list of records.
   B. One pass through a file being sorted.
   C. The external sorting process itself.
   D. The replacement selection process.
7. A good hash function will ( ).
   A. Use the high-order bits of the key value.
   B. Use the middle bits of the key value.
   C. Use the low-order bits of the key value.
   D. Make use of all bits in the key value.
8. The single-source shortest path problem can be used to ( ).
   A. Sort all of the graph vertices by value.
   B. Sort all of the graph vertices so that each vertex is listed prior to any others that depend on it.
   C. Sort all of the graph vertices by distance from the source vertex.
   D. Compute the shortest path only for directed graph.
9. In the following sort algorithms, which might require the maximum running time cost for an ordered sequence? ( )
   A. Selection sort
   B. Bubble sort
   C. Quicksort
   D. Insertion sort
10. The asymptotic cost of inserting and deleting of one record from B+-tree trees is ( ).
   A. $\Theta(n)$
   B. $\Theta(n\log n)$
   C. $\Theta(n^2)$
   D. $\Theta(\log n)$
11. Which is the max-heap that results from running BuildHeap on the following values stored in an array: 46，79，56，38，40，84？( )
   A. 79，46，56，38，40，84
   B. 84，79，56，38，40，46
   C. 84，79，56，46，40，38
   D. 84，56，79，40，38，46

12. The figure below shows an undirected graph with 9 vertexes. List the order in which the vertexes are visited using breadth-first search(BFS), starting at Vertex A.



( )

A. ABCFDGEHI

B. ABDECGFHI

C. ABDECGHIF

D. ABDECGFHI

13. Hashing is most appropriate for ( ).

A. In-memory applications.

B. Disk-based applications.

C. Either in-memory or disk-based applications.

D. None of the above.

14. Assume a BST is implemented so that all nodes in the left subtree of a given node have values less than that node, and all nodes in the right subtree have values greater than or equal to that node. When implementing the delete routine, we must select ( ) as its replacement.

A. The greatest value from the left subtree.

B. The least value from the right subtree.

C. Either of the above.

D. None of the above.

15. An algorithm must be or do all of the following EXCEPT ( ).

A. correct

B. composed of concrete steps

C. ambiguous

D. composed of a finite number of steps

评阅教师	得分

二、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. The order of input data makes a difference to running time of Quicksort.

a) For the values 1 through 15, give two permutations that will cause Quicksort to have its best case and worst case behaviors. (By default, Quicksort is implemented as in Section 7.5 of textbook. Otherwise, you'd better point which one is pivot.)

b) How many partitions should be done to complete the Quicksort in best case and worst case for the values 1 through 15?

2. Assume that you have a 9 slots closed hash. If you used the hash function h(k) = k % 9 and

pseudo-random probing, here the pseudo-random probing sequence d_i will be: 5,9,2,1,4,8,6,3,7.

a) Show the final hash table after inserting the number sequence: 3, 27, 15, 72, 60, 12.

b) After filling the above numbers, calculate the probability for each empty slot that it will be the next one filled.

c) Determine the ASL（平均关键字比较次数）when searching sequence 3, 27, 15, 72, 60, 12, 54 in the hash table

3. Given the following set of letters and weights:

Letter	a	b	c	k	l	o	r	t	e	d
Weight	2	36	5	30	7	9	13	16	18	3

a) Build the Huffman coding tree.

b) Determine the Huffman code for each letter.

c) Represent the word "broke" by bit stream using the code in (b).

4. You are given a series of records whose keys are numbers. The records arrive in the following order: 36, 69, 53, 84, 23, 18, 61, 50, 79, 45. Show the 2-3 tree that results from inserting these records.

评阅教师	得分

三、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. Write a function that prints out the node values for a BST in sorted order from highest to lowest.

2. You are given a linked list **L**, and another linked list **P**, containing integers sorted in ascending order. The operation **PrintLots(L, P)** will print the elements in **L** that are in positions specified by **P**. For instance, if **P** = 1, 3, 4, 6, the first, third, fourth, and sixth elements in **L** are printed. Write the function **PrintLots(L, P)**. What is the running time of your algorithm?

评阅教师	得分

四、分析题（本大题共 1 小题，共 16 分）。

Think of the WeChat（微信） system. In your opinions which data structures and algorithms are used in some typical functions of WeChat?