四川大学期末考试试题（闭卷）

（2020~2021 学年第 1 学期）　　B 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 2019 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(40%)	三(20%)	四(10%)			
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答题纸上；

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，请将其代码填写在答题纸上。错选、多选或未选均无分。

1. Insert an x node into a chain stack whose top pointer is top, then execute (　　).

   A. x->next =top->next; top->next=x;

   B. top->next=x;

   C. x->next=top, top=x;

   D. x->next=top, top=top->next;

2. 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.

3. Which is the max-heap that results from running buildHeap on the following values stored in an array: 1, 5, 7, 4, 2,6, 3？(　　)

   A. 7, 5, 1, 4, 2, 6, 3

   B. 7, 4, 6, 1, 2, 3, 5

C. 7, 5, 6, 4, 2, 1, 3

D. 7, 4, 6, 2, 3, 5, 1

4. The following statement about graph traversal is incorrect ( ).

A. The DFS of connected graphs is a recursive process

B. The search for adjacent nodes in the BFS of graphs has the feature of "first in, first out"

C. Unconnected graphs cannot use DFS

D. The traversal of the graph requires each vertex to be visited only once

5. Usually, hashing is appropriate for ( ).

A. Multiple records are allowed to have the same key value.

B. Find all records whose key value is within a certain range.

C. The record with the largest or smallest key value.

D. If it exists, to find the record whose key value is K.

6. Insert {6, 9, 12, 3, 4, 8} into an empty BST. Then the subsequence of postorder traversal of the tree is ( ).

A. 4, 3, 6, 8, 12, 9 .

B. 4, 3, 8, 12, 9, 6.

C. 3, 4, 6, 8, 12, 9.

D. 3, 4, 9, 8, 12, 6.

7. The best case for an algorithm refers to ( )

A. The smallest possible input size.

B. The specific input instance of a given size that gives the greatest cost

C. The largest possible input size that meets the required growth rate.

D. The specific input instance of a given size that gives the lowest cost.

8. The priority queue is a structure implementing ( ) .

A. inserting item only at the rear of the priority queue.

B. inserting item only at the front of the priority queue.

C. deleting item according to the priority of the item.

D. first in/first out

9. In a singly linked list HL without a head node, insert a node pointed to by the pointer p into the header of the list:

A. HL＝p； p->next＝HL；

B. p->next＝HL；HL＝p；

C. p->next＝HL；p＝HL；

D. p->next＝HL->next; HL->next＝p；

10. If the number of leaf nodes in a Huffman tree with degree m (an internal node has m children) is n,

then the number of non-leaf nodes is ( ).

A. n-1 B. ⌊n/m⌋-1 C. ⌈(n-1)/(m-1)⌉ D. ⌈n/(m-1)⌉-1

11. Suppose that a record is 32 bytes, a block is 1024 bytes, and that working memory is 1MB. What is the expected size for the largest file that can be merged using replacement selection followed by a single pass of multiway merge? ( )

A. 512MB B. 1GB C. 2GB D. 4GB

12. On the premise that a sequence of elements which is basically ordered, the most efficient sort method is ( )。

A. Insertion sort B. Selection sort C. Quicksort D. Mergesort

13. Sort the sequence {15, 9, 7, 8, 20, -1, 4}, and the result after the first sorting pass is {4, 9, -1, 8, 20, 7, 15}, then the sort method used is ( )

A. Selection Sort B. Shellsort C. Quicksort D. Bubble Sort

14. The enqueue operation for a circular queue with array A[0…m] is ( )

A. rear=rear+1 B. rear=(rear+1) mod (m-1)
C. rear=(rear+1) mod m D. rear=(rear+1) mod (m+1)

15. The 80/20 rule indicates that ( )

A. 80% of the searches in typical databases are to 20% of the records.

B. 80% of searches in typical databases are successful and 20% are not.

C. 80% of records in typical databases are of value, 20% are not.

D. 20% of the searches in typical databases are to 80% of the records.

评阅教师	得分

二、应用题（本大题共 5 小题，每小题 8 分，共 40 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 10 element complete binary tree is represented by the array [15, 67, 35, 27, 74, 56, 78, 89, 36, 93].

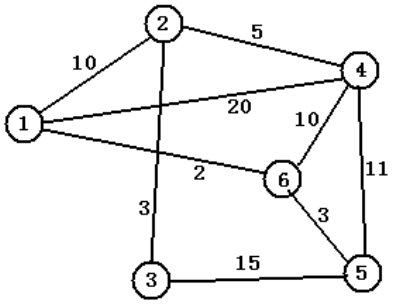
1) Show the min-heap that results from running buildHeap on this array.

2) Show the heap that results from deleting the minimum value from the min-heap of 1).

2. You are given a series of records whose keys are numbers. The records arrive in the following order: 53, 7, 23, 57, 62, 66, 33, 34, 25, 69, 68, 6, 44, 78, 63. Show the 2-3 tree that results from inserting these records.

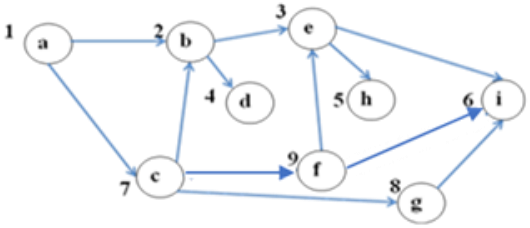
3. Given values 16, 7, 9, 23, 15, 21, 58, 31, 25, 63, 7, 37, write the first pass steps of Shellsort with increment of 4.

4. Given the following undirected graph,



1) List the order of the edges which are added into MST when running Prim's MST algorithm. Starting at vertex 6.
2) Show the final MST

5. Given the following DAG,



1) Represent the graph using Adjacency Matrix.
2) Represent the graph using Adjacency List.
3) Give out the Queue-Based(BFS-based) Topsort result of the graph.

评阅教师	得分

三、编程题（本大题共 2 小题，每小题 10 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 an algorithm to judge whether a given binary tree is a complete binary tree.
2. Write an algorithm to determine whether there is a cycle in the graph.

评阅教师	得分

四、非标准答案题（本大题共 1 小题，共 10 分）。

提示：根据自己的理解和知识背景，对题目给出分析和阐述。

Give your opinions about the following sentence:

"It is hardly ever true that one data structure is better than another for use in all situations，so one should make a concrete analysis of each specific application and select the better data structure for the specific application he faced."

You can explain your opinions by examples.