Alg&DS1 exam 2021.05.20

Due May 20, 2021 at 11:40am **Points** 50 **Questions** 15
Available until May 20, 2021 at 11:45am **Time Limit** 100 Minutes

Instructions

Many algorithms, methods, data structures, and types have different versions. These questions refer to the version you have seen in the classroom and/or you have learnt from my lecture notes.

Grade: If P≥44 then 5 ; else if P≥38 then 4 ; else if P≥32 then 3 ; else if P≥26 then 2 ; else 1.

This quiz is no longer available as the course has been concluded.

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	48 minutes	44 out of 50

Correct answers are no longer available.

Score for this quiz: **44** out of 50
Submitted May 20, 2021 at 10:48am
This attempt took 48 minutes.

Question 1

1 / 1 pts

If the Inorder traversal of binary tree *t* processes the keys in strictly increasing order, then *t* is BST.

- (●) True
- ( ) False

Question 2

1 / 1 pts

The minimal element of a binary search tree may have two children.

- True
- False

Question 3

1 / 1 pts

The maximum running time of *quicksort* and that of *merge sort* are asymptotically equivalent.

- True
- False

Question 4

1 / 1 pts

The height of a binary search tree is *O(log n)* where *n* is the size of the tree.

- True
- False

Incorrect

Question 5

0 / 1 pts

If both sorts are applicable, *merge sort* may run faster then *radix sort*.

- True
- False

Question 6

1 / 1 pts

Adding a new key to a maximum heap needs Ω(log n) time where n is the size of the heap.

- True
- False

Incorrect

Question 7

0 / 1 pts

If *t* is a binary tree where the key of each parent is greater or equal to the keys of its children, then *t* is a maximum heap.

- True
- False

Incorrect

Question 8

0 / 1 pts

The minimum running time of *heap sort* and that of *radix sort* are asymptotically equivalent.

- True
- False

Incorrect

Question 9

0 / 1 pts

Function $n^2+2n-1 \in O(n^3)$.

- ○ True
- ◉ False

Incorrect

Question 10

0 / 1 pts

Function $n^{1.01}$ is asymptotically greater than function $n*(\log n)$.

- ○ True
- ◉ False

Partial

Question 11

7 / 8 pts

Open addressing — Double hashing

Given a hash table with 11 slots.

Primary hash function: $h_1(k) = k \bmod 11$
Secondary hash function: $h_2(k) = 1 + (k \bmod 10)$

The initial content of the hash table:

0	1	2	3	4	5	6	7	8	9	10
31		46	D	26		72		8	D	

Perform the following operations on the hash table, one after the other (using the result of the previous operation), and answer the questions. {The elements of a probing sequence must be separated by commas. No other character should be used, no blank. (i.e.: 9,0,2 etc.)}

1. Insert 18. The actual probing sequence: 7
2. Insert 13. The actual probing sequence: 2,6,10
3. Search 41. The actual probing sequence: 8,10,1
4. Delete 31. The actual probing sequence: 9,0

5. Search 30. The actual probing sequence: 8,9,10,0,1

6. Delete 80. The actual probing sequence: 3,4,5

7. Insert 33. The actual probing sequence: 0

8. Give the content of the resulting hash table. The content of the slots must be separated by commas. Letter E means an *empty slot*, letter D means a *deleted slot*. (For example, the initial hash table above: 31,E,46,D,26,E,72,E,8,D,E)
   33,E,46,D,26,E,72,1

Answer 1:

7

Answer 2:

2,6,10

Answer 3:

8,10,1

Answer 4:

9,0

Answer 5:

8,9,10,0,1

Answer 6:

3,4,5

Answer 7:

0

Answer 8:

33,E,46,D,26,E,72,18,8,D,13

Question 12

8 / 8 pts

Perform merge sort on the following array. $A = \langle 6, 7, 8, 2, 3, 5, 4, 9, 1 \rangle$

Give the result of each merge operation on the appropriate subarray in turn. The items must be separated by commas. No other character should be used, no blank (i.e. 65,78,195).

1. 6,7
2. 2,8
3. 2,6,7,8
4. 3,5
5. 1,9
6. 1,4,9
7. 1,3,4,5,9
8. 1,2,3,4,5,6,7,8,9

Answer 1:

6,7

Answer 2:

2,8

Answer 3:

2,6,7,8

Answer 4:

3,5

Answer 5:

1,9

Answer 6:

1,4,9

Answer 7:

1,3,4,5,9

Answer 8:

1,2,3,4,5,6,7,8,9

Question 13

8 / 8 pts

Given the following **list** (d = 3, r = 4):
⟨201,112,330,232,331,001,220,111,000,312⟩

Illustrate **radix sort on lists** as you have seen in the classroom. Answer the following questions.

Show the lists after the different passes. The keys of the items must be separated by commas. No other character should be used, no blank. (i.e.: 231,111,010 etc.)

1. pass: 330,220,000,201,3

2. pass: 000,201,001,111,1

3. pass: 000,001,111,112,2

List the keys of the elements of bin 3 after the distribution phase of the second pass. (The keys must be separated by commas. No other character should be used, no blank.)

bin 3: 330,331,232

Answer 1:

330,220,000,201,331,001,111,112,232,312

Answer 2:

000,201,001,111,112,312,220,330,331,232

Answer 3:

000,001,111,112,201,220,232,312,330,331

Answer 4:

330,331,232

Question 14

8 / 8 pts

1. Given heap ⟨ 80, 60, 40, 10, 50, 3, 7, 5, 8, 20 ⟩. — Which heap is the result of adding 90? {The items of a level must be separated by commas. No other character should be used, no blank (i.e. 65,78,195).}

Level 0: 90

Level 1: 80,40

Level 2: 10,60,3,7

Level 3: 5,8,20,50

2. Given heap ⟨ 80, 60, 40, 10, 50, 3, 7, 5, 8, 20 ⟩. — Which heap is the result of removing its maximum?

Level 0: 60

Level 1: 50,40

Level 2: 10,20,3,7

Level 3: 5,8

Answer 1:

90

Answer 2:

80,40

Answer 3:

10,60,3,7

Answer 4:

5,8,20,50

Answer 5:

60

Answer 6:

50,40

Answer 7:

10,20,3,7

Answer 8:

5,8

Question 15

8 / 8 pts

We have a binary search tree. Its Preorder traversal is the following one:

8, 5, 3, 1, 7, 6, 9

Supply its Postorder traversal: 1,3,6,7,5,9,8

Delete 5 from this binary search tree as you have seen it in the classroom.

Supply the Level order traversal of the resulting binary search tree:

8,6,9,3,7,1

(Do not use blanks. Separate the numbers with commas. No punctuation mark at the end.)

Answer 1:

1,3,6,7,5,9,8

Answer 2:

8,6,9,3,7,1

Quiz Score: **44** out of 50