

Example Questions: Trees

Due No due date

Points 49

Questions 13

Time Limit None

Allowed Attempts Unlimited

Take the Quiz Again

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	18 minutes	0 out of 49

Submitted Dec 16 at 12:24pm

Question 1

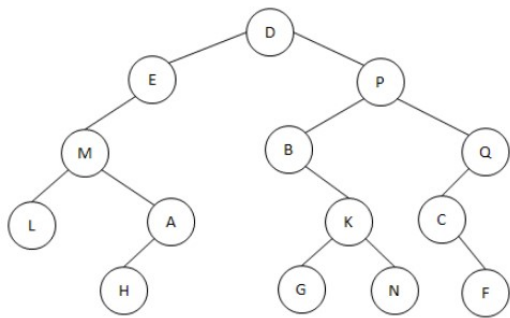
0 / 4 pts

How many nodes have balance '=' in the tree below?

At which node the *balanced* property is most violated?

The balance of this node (integer value) =

What is the balance of node M (+ or - or =) ?



Answer 1:

You Answered

(You left this blank)

Correct Answer

8

Answer 2:

You Answered

(You left this blank)

Correct Answer

E

Correct Answer

e

Answer 3:

You Answered

(You left this blank)

Correct Answer

-3

Answer 4:

You Answered

(You left this blank)

Correct Answer

'+'

Correct Answer

+

Correct Answer

"+"

Question 2

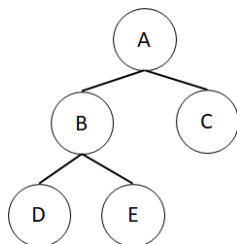
0 / 3 pts

Let us suppose that in the tree below $D < B < E < A < C$, i.e. it is an AVL tree. We insert a new node into it.

Which rotation must be used, if the new node becomes the right child of node D? [Select]

Which rotation must be used, if the new node becomes the right child of node C? [Select]

Which rotation must be used, if the new node becomes the right child of node E? [Select]



Answer 1:

You Answered

(You left this blank)

Correct Answer

(--,-)

Answer 2:**You Answered**

(You left this blank)

Correct Answer

No rotation

Answer 3:**You Answered**

(You left this blank)

Correct Answer

(--,+)

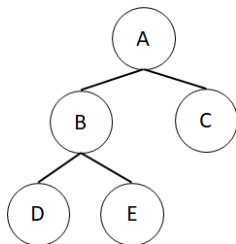
Question 3**0 / 3 pts**

Let us suppose that in the tree below $D < B < E < A < C$, i.e. it is an AVL tree. We delete a node from it.

Which rotation must be used, when we delete the maximal node? [Select]

Which rotation must be used, when we delete the minimal node? [Select]

Which rotation must be used, when we delete the root node? (We suppose that the deletion is performed with the algorithm variant familiar from the lecture.) [Select]

**Answer 1:****You Answered**

(You left this blank)

Correct Answer

(--,=)

Answer 2:**You Answered**

(You left this blank)

Correct Answer

No rotation

Answer 3:**You Answered**

(You left this blank)

Correct Answer

(--,=)

Unanswered**Question 4****0 / 6 pts**

Let t be an AVL tree . Select the true statements.

☐ Deletion decreases the height of the tree.

When we delete a root node, we can substitute it with the maximal node of its left subtree or the minimal node of its right subtree.

Correct Answer☐ Deleting a leaf is not necessarily a special case.**Correct Answer**

The deletion of a key needs not more than $1.45 * \log n$ rotations where $n > 0$ is the size of the tree.

☐ Removing the minimal node needs maximum one rotation.**Correct Answer**☐ The deletion of a key may need more rotations.**Unanswered****Question 5****0 / 6 pts**

Let t be an AVL tree . Select the true statements.

☐ t is a nearly complete binary tree.**Correct Answer**☐ The inorder traversal of t yields an increasing sequence of keys.

Provided that the balance of an internal node of t is '+', then the left subtree of that node is higher than its right subtree.

Correct Answer
☐ The minimal node of t may have right child.

☐ Tree t may have a leaf with nonzero balance.
Correct Answer
☐ Provided that t has 3 nodes, its depth cannot be 2.
Question 6**0 / 3 pts**

Given AVL tree $\{ [(1) 2 (<3> 4)] 5 [(< 6 \{7\} > 8 <9>) 10 (<11> 12 < 13 \{14\} >)] \}$. Remove its minimal node with the algorithm familiar from the lectures. Then present the preorder traversal of the resulting tree. Each box should contain the key of a single node. In case of internal nodes the key must be immediately followed by its balance (+ or - or =), for example 2+ or 4- or 10=. Nothing else should be written into the boxes. In case of leaf nodes, only the key should be presented.

Answer 1:**You Answered**

(You left this blank)

Correct Answer

10-

Answer 2:**You Answered**

(You left this blank)

Correct Answer

5+

Answer 3:**You Answered**

(You left this blank)

orrect Answer

3=

ou Answered

Answer 4:

(You left this blank)

orrect Answer

2

ou Answered

Answer 5:

(You left this blank)

orrect Answer

4

ou Answered

Answer 6:

(You left this blank)

orrect Answer

8-

ou Answered

Answer 7:

(You left this blank)

orrect Answer

6+

ou Answered

Answer 8:

(You left this blank)

orrect Answer

7

ou Answered

Answer 9:

(You left this blank)

orrect Answer

9

ou Answered

Answer 10:

(You left this blank)

orrect Answer

12+

ou Answered

Answer 11:

(You left this blank)

Correct Answer

11

Answer 12:

You Answered

(You left this blank)

Correct Answer

13+

Answer 13:

You Answered

(You left this blank)

Correct Answer

14

Unanswered

Question 7

0 / 3 pts

Given the following AVL tree: $\{ [(1) 2 (\{3\} 4)] 5 [(6) 7] \}$. Let we delete key 5. Which of the following alternatives is the result, if we apply the algorithm variant known from the lecture?

☐ $\{ [1+ (2)] 3= [(4) 6= (7)] \}$
☐ $\{ [(1) 2= (3)] 4= [(6) 7-] \}$
☐ $\{ [(1) 2-] 3= [(4) 6= (7)] \}$

Correct Answer

☐ $\{ [(1) 2= (3)] 4= [6+ (7)] \}$

Unanswered

Question 8

0 / 1 pts

Apply the appropriate balancing rotation to BST $(3++ (4) 5-)$. Which is the result of the rotation?

☐ $(3++ (4+ (5)))$
☐ $((3) 5= (4))$

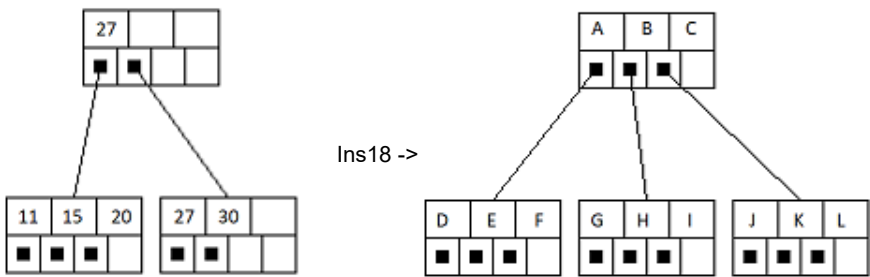
Correct Answer

☐ $((3) 4= (5))$

Question 9

0 / 3 pts

Consider the following B+ tree. Insert 18. What are the (split) keys of the new tree? (*Minus sign means no key.*)



You Answered

A:

Correct Answer 18

You Answered

B:

Correct Answer 27

You Answered

C:

Correct Answer -

You Answered

D:

Correct Answer 11

You Answered

E:

Correct Answer 15

You Answered

F:

Correct Answer

-

You Answered

G:

Correct Answer

18

You Answered

H:

Correct Answer

20

You Answered

I:

Correct Answer

-

You Answered

J:

Correct Answer

27

You Answered

K:

Correct Answer

30

You Answered

L:

Correct Answer

-

Question 10

0 / 3 pts

Consider the following B+ tree:

$[(9, 10) 11 (12, 13) 14 (15, 16, 17) 18 (19, 20)]$

Insert 14 into it. What is the textual representation of the resulting tree? (Let the order of the brackets be: "[(". Do not use blanks. The keys of the leaf nodes must be separated with commas.)

You Answered

Correct Answers

$\{[(9,10)11(12,13)14(14,15)]16[(16,17)18(19,20)]\}$

Question 11

0 / 3 pts

Consider the following B+ tree. Insert 18. What are the (split) keys of the new tree? (*Minus sign means no key.*)

$\{[(1, 2) 3 (4, 5)] 7 [(11, 15, 20) 27 (27, 30)]\}$

Delete key 4 from the tree. What is the textual representation of the resulting B+ tree? (Let the order of the different kinds of brackets be: "[(". Separate the keys of the leaves with commas. Do not use blanks.)

You Answered

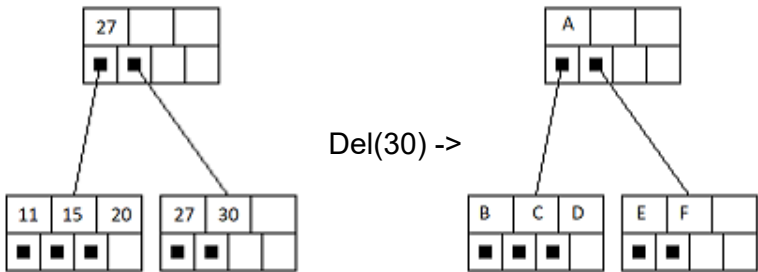
Correct Answers

$[(1,2,5)7(11,15,20)27(27,30)]$

Question 12

0 / 3 pts

Consider the following B+ tree. Delete key 30. What are the (split) keys of the new tree? (*Minus sign means no key.*)



You Answered

A:

Correct Answer 20

You Answered

B:

Correct Answer 11

You Answered

C:

Correct Answer 15

You Answered

D:

Correct Answer -

You Answered

E:

Correct Answer 20

You Answered

F:

Correct Answer 27

Unanswered

Question 13

0 / 8 pts

Let t be a B+ tree. Let its degree be d . Let it contain n keys (not including the split keys, as usual). Select the true statements.

Correct Answer

☐ All the leaves are at the same depth.

☐ Split keys may be also in the leaves.

☐

Consider internal node N where k is the number of keys in node N . In the i th subtree ($2 \leq i \leq k$) of node N , for any key r , $N.key[i-1] < r \leq N.key[i]$ (where we index keys and subtrees from 1).

Correct Answer

☐ In a B+ tree with degree d , $d \geq 4$.

Correct Answer

☐ It is possible that during insertion we create a new root node.

Correct Answer

☐ The running time of search is $O(\lg n)$.

☐ Normal keys can be at any level.

☐ Each node has maximum $d-1$ pointers, and maximum d keys.