

Data Structure

Tree

DPP 05

[NAT]

1. The minimum number of nodes in AVL tree of height 6 is _____.
(Assume that the height of the root node is 1)

[MCQ]

2. Consider the following statements:

P: An AVL tree is a height-balanced complete binary tree.

Q: A heap is necessarily a complete binary tree.

Which of the following statement(s) is/are CORRECT?

- (a) P only
- (b) Q only
- (c) Both P and Q
- (d) Neither P nor Q

[NAT]

3. The total number of ways in which a max-heap can be constructed with the keys-7, 6, 1, 4, 5, 2, 3 is _____.

[MCQ]

4. Consider the following statements:

P: If the root node of a BST is deleted, it can be replaced by inorder predecessor.

Q: If the root node of a BST is deleted, it can be replaced by preorder successor.

Which of the following is/are CORRECT?

- (a) P only
- (b) Q only
- (c) Both P and Q
- (d) Neither P nor Q

[MSQ]

5. Consider the following operations in a BST-
INSERT(23), INSERT(17), INSERT(25), INSERT(4),
INSERT(21), INSERT(1), INSERT(7), DELETE(17),
DELETE(23).

The post-order traversal of the resultant BST is-

- (a) 1, 7, 4, 21, 25
- (b) 1, 4, 7, 25, 21
- (c) 1, 4, 21, 7, 25
- (d) None of the above

[MSQ]

6. Which of the following sequence(s) of array form a heap?

- (a) 23, 17, 14, 6, 13, 10, 1, 12, 7, 5
- (b) 1, 5, 10, 6, 7, 12, 13, 14, 17, 23
- (c) 23, 17, 14, 7, 13, 10, 1, 5, 6, 12
- (d) 1, 5, 10, 12, 13, 7, 14, 17, 23, 6

[NAT]

7. Consider the following statements:

P: The accepted balanced factor in an AVL tree are -1, 0 and +1.

Q: The height of an AVL tree with n nodes is given as $\lceil \log_2 n \rceil$.

The number of INCORRECT statements is _____.

[NAT]

8. Construct an AVL tree with the following keys:

12, 10, 15, 14, 13, 17, 8

The immediate left child key value of the root node of the AVL tree is _____.

Answer Key

- | | |
|---------|--------------|
| 1. (20) | 5. (a, b, c) |
| 2. (b) | 6. (b, c) |
| 3. (80) | 7. (0) |
| 4. (a) | 8. (12) |



Hint & Solutions

1. (20)

The minimum number of nodes in an AVL tree of height 'h' is given by-

$$n(h) = n(h-1) + n(h-2) + 1$$

$$n(1) = 1, n(2) = 2, n(3) = 4, n(4) = 7, n(5) = 12, n(6) = 20$$

2. (b)

P: INCORRECT. An AVL tree is not necessarily a complete binary tree.

Q: CORRECT. A heap is necessarily a complete binary tree.

3. (80)

$$T(n) = 1 * \binom{n-1}{k} * T(k) * T(n-k-1)$$

$$\text{Here } n = 7, k = 3$$

$$T(7) = 1 * \binom{6}{3} * T(3) * T(3)$$

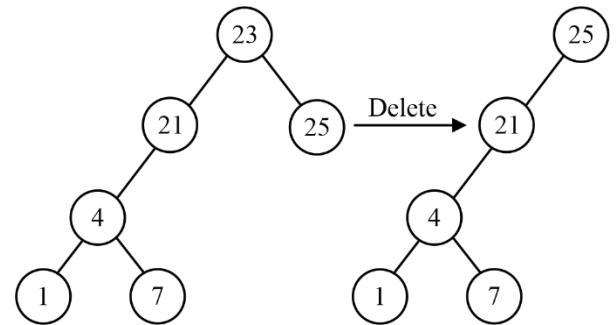
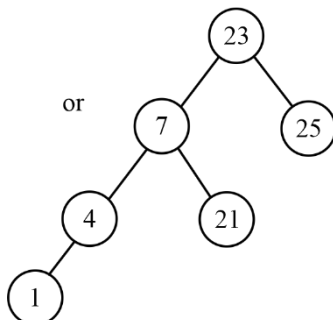
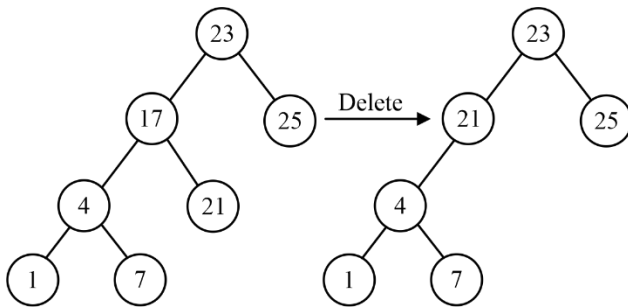
$$\text{Now, } T(3) = 2$$

$$T(7) = 1 * \binom{6}{3} * 2 * 2 = 80$$

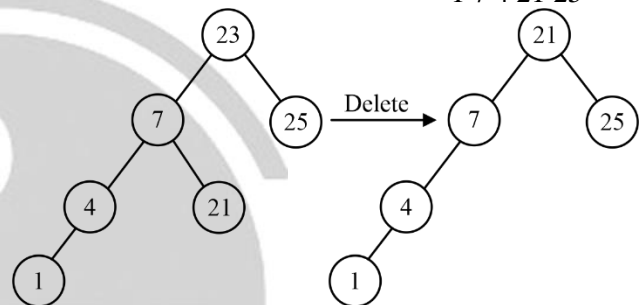
4. (a)

If the root node of a BST is deleted, it can be replaced by inorder predecessor/successor.

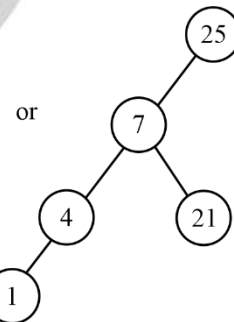
5. (a, b, c)



Post order traversal: -
1 7 4 21 25



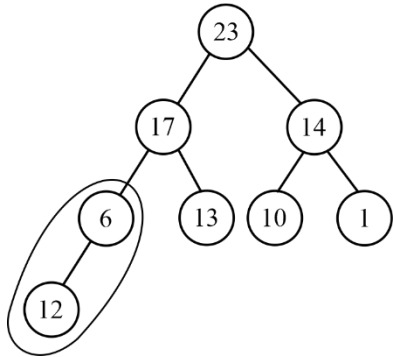
Post order traversal: -
1 4 7 25 21



Post order traversal: -
1 4 21 7 25

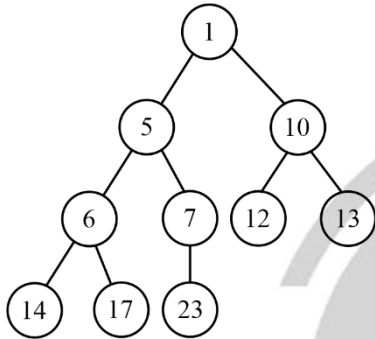
6. (b, c)

(a)



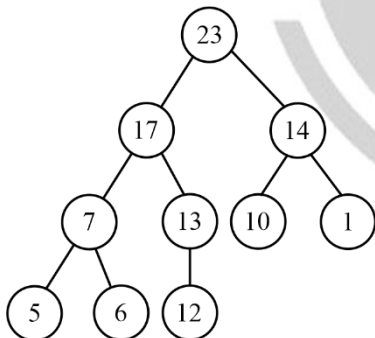
Not possible defies max-heap property

(b)



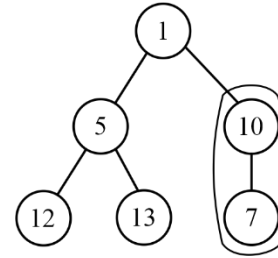
Satisfies min-heap property

(c)



Satisfies max-heap property.

(d)



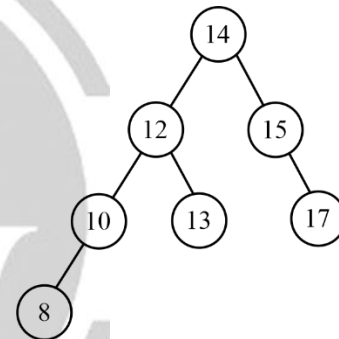
Not possible defies min-heap property

7. (0)

Both the statements are CORRECT.

8. (12)

Resultant AVL tree:



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PW Mobile APP: <https://smart.link/7wwosivoicgd4>