#### DATA STRUCTURES AND ALGORITHMS\_18B11CS211\_18Dec20 (18B11CS211)



**Aayushie** 

Test Taken on: December 18, 2020 11:36:39 AM IST

Finish State: Auto submit

#### **Registration Details**

**Email** 19104008@mail.jiit.ac.in

Address:

B-11

**First Name:** Aayushie **Enrollment** 19104008

No.:

Batch No.:

19104008@mail.jiit.ac.in

**Profile Picture Snapshot** 

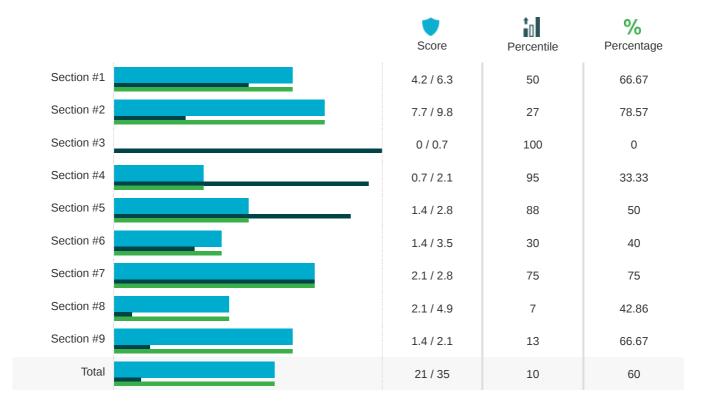


#### **Identity Card Snapshot**



#### **Overall Summary**

#### MARKS SCORED



1 29 min

Available time: 1 hr 30 min

#### **TOTAL QUESTIONS**

50

20 Incorrect (Scored 0/14)

30 Correct (Scored 21/21)

#### **Section-wise Details**

#### Section #1

#### MARKS SCORED



#### **SUMMARY OF ATTEMPTS**

# 3 Incorrect (Scored 0/2.1) 6 Correct (Scored 4.2/4.2)

#### TIME TAKEN

0	13
hr	min

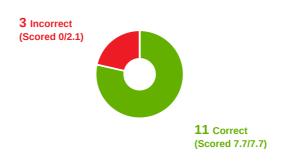
This was untimed section.

#### **TOTAL QUESTIONS**

#### MARKS SCORED



#### **SUMMARY OF ATTEMPTS**



#### TIME TAKEN

0	28
hr	min

This was untimed section.

#### **TOTAL QUESTIONS**

#### MARKS SCORED

	Score	% e Percentage
CO3_DSA-2020	0/0.	7 0
Total	0/0.	7 0

#### **SUMMARY OF ATTEMPTS**



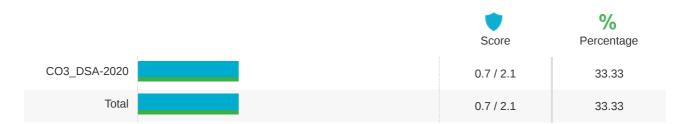
#### TIME TAKEN

0	4
hr	min

This was untimed section.

#### **TOTAL QUESTIONS**

#### MARKS SCORED



#### **SUMMARY OF ATTEMPTS**



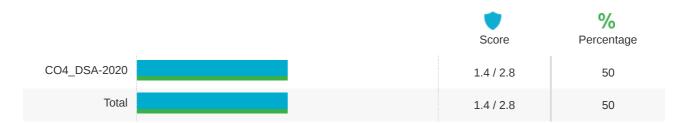
#### TIME TAKEN

0	13
hr	min

This was untimed section.

#### **TOTAL QUESTIONS**

#### MARKS SCORED



#### **SUMMARY OF ATTEMPTS**



#### TIME TAKEN

0	3
hr	min

This was untimed section.

#### **TOTAL QUESTIONS**

#### MARKS SCORED



#### **SUMMARY OF ATTEMPTS**



#### TIME TAKEN

0	8
hr	min

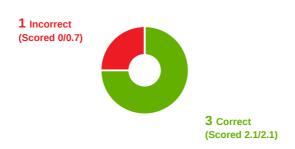
This was untimed section.

#### **TOTAL QUESTIONS**

#### MARKS SCORED



#### **SUMMARY OF ATTEMPTS**



#### TIME TAKEN

0	4
hr	min

This was untimed section.

#### **TOTAL QUESTIONS**

#### MARKS SCORED



#### **SUMMARY OF ATTEMPTS**



#### TIME TAKEN

0	8
hr	min

This was untimed section.

#### **TOTAL QUESTIONS**

#### MARKS SCORED



#### **SUMMARY OF ATTEMPTS**



#### TIME TAKEN

0	6
hr	min

This was untimed section.

#### **TOTAL QUESTIONS**

### **Question-wise Details**

#### Section #1

Question 1: Time: 35 Sec Marks: 0 / 0.7

The complexity of the average case of an algorithm is

Options	Response	Answer
Much more complicated to analyze than that of worst case		•
Much more simpler to analyze than that of worst case	•	
Sometimes more complex and some other times simpler than that of worst case		
None of the above		

**Question 2:** Time: 1 Min 58 Sec Marks: 0.7 / 0.7

The time complexity of recurrence equation  $T(n) = 2T(n/8) + n^{1/3}$  is

Options	Response	Answer
$\theta(n^{1/3})$		
θ(n <sup>1/3</sup> n)		
θ(n lg n)		
θ(n <sup>1/3</sup> lg n)	•	•

Question 3: Time: 1 Min 30 Sec Marks: 0 / 0.7

Options	Response	Answer
worst case of Merge Sort	•	
worst case of Quick Sort		•
both of the above		
none of the above		

Question 4:	Time: 1 Min 47 Sec	Marks: 0 / 0.7	
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What will be the running-time of Dijkstra's single source shortest path algorithm, if the graph G(V,E) is stored in form of adjacency list and binary heap is used?

Options	Response	Answer
O( V  <sup>2</sup> )		
O( V  log  V )		<b>✓</b>
O( E + V  log  V )	•	
None of the above		

Question 5: Time: 1 Min 46 Sec Marks: 0.7 / 0.7

Which of the following can be done in  $O(\log N)$  arithmetic operations?

Options	Response	Answer
Raising a number to the Nth power		
Computing the greatest common divisor of some integer and <i>N</i>		
Computing the multiplicative inverse of some number A mod N		
All of the above	•	•

Question 6: Time: 2 Min 46 Sec Marks: 0.7 / 0.7

Options	Response	Answer
T(n) = 2T(n - 2) + 2		
T(n) = 2T(n - 1) + n		
T(n) = 2T(n/2) + 1		
T(n) = 2T(n-1) + 1	•	•

Question 7: Time: 28 Sec Marks: 0.7 / 0.7

Time required to merge two sorted lists of size m and n is

Options	Response	Answer
O(m   n).		
O(m + n).	•	•
O(m log n).		
O(n log m).		

Question 8: Time: 1 Min 32 Sec Marks: 0.7 / 0.7

If T1(N) = O(F(N)) and T2(N) = O(F(N)) then which of the following is true?

Options	Response	Answer
T1(N) + T2(N) = O(F(N))	•	•
T1(N)* T2(N) = O(F(N))		
T1(N) / T2(N ) = O(1)		
T1(N) = O(T2(N))		

 Question 9:
 Time: 49 Sec
 Marks: 0.7 / 0.7

Let W(n) and A(n) be the worst case and average case running time of an algorithm executed on an input of size n. Which of the following is true?

Options	Response	Answer
$A(n) = \Omega(W(n))$		
$A(n) = \Theta(W(n))$		
A(n) = O(W(n))	•	•
A(n) = o(W(n))		

Question 1:	Time: 1 Min 31 Sec	Marks: 0.7 / 0.7	

How many comparisons are needed to sort an array of length 5 if selection sort is used and array is already reverse sorted?

Options	Response	Answer
15		
20		
10	•	•
1		

Question 2: Time: 23 Sec Marks: 0.7 / 0.7

A complete graph can have

Options	Response	Answer
n <sup>2</sup> spanning trees.		
$n^{n-2}$ spanning trees.	•	•
n <sup>n+1</sup> spanning trees.		
n <sup>n</sup> spanning trees.		

Question 3: Time: 1 Min 56 Sec Marks: 0.7 / 0.7

Maximum degree of any vertex in a simple graph of vertices n is

Options	Response	Answer
2n - 1		
n		
n+1		
n - 1	•	•

Question 4: Time: 1 Min 24 Sec Marks: 0.7 / 0.7

The array representation of a complete binary tree contains the data in sorted order. Which traversal of the tree will produce the data in sorted form?

Options	Response	Answer
Preorder		
Inorder		
Postorder.		
Level Order.	<b>✓</b>	•

Question 5: Time: 1 Min 46 Sec Marks: 0.7 / 0.7

Which of the following sorting algorithms has the lowest worst-case time complexity?

Options	Response	Answer
Merge Sort	•	•
Bubble Sort		
Quick Sort		
Selection Sort		

Question 6: Time: 4 Min 34 Sec Marks: 0 / 0.7

A node with key 8 has a left child with key 10. Which of the following objects could this node be found in?

Options	Response	Answer
binary search tree		
max heap	•	
min heap		•
All of the above		

Question 7: Time: 1 Min 41 Sec Marks: 0.7 / 0.7

Options	Response	Answer
The lengths of the paths from the root to all leaf nodes are all equal.	•	•
The lengths of the paths from the root to all leaf nodes differ from each other by at most 1.		
The number of children of any two non-leaf sibling nodes differ by at most 1.		
The number of records in any two leaf nodes differ by at most 1.		

Question 8: Time: 1 Min 4 Sec Marks: 0 / 0.7

The elements of an array are stored successively in memory cells because

Options	Response	Answer
by this way computer can keep track only the address of the first element and the addresses of other elements can be calculated		•
the architecture of computer memory does not allow arrays to store other than serially		
both of the above	•	
none of the above		

Question 9: Time: 9 Sec Marks: 0.7 / 0.7

Which data structure is used by the compiler to implement recursion?

Options	Response	Answer
тар		
priority queue		
queue		
stack	•	•

**Question 10:** Time: 3 Min 31 Sec Marks: 0.7 / 0.7

Which of the following statements is/are TRUE for an undirected graph?

P: Number of odd degree vertices is even

Q: Sum of degrees of all vertices is even

Options	Response	Answer
P Only.		
Q Only.		
Both P and Q.	•	<b>✓</b>
Neither P nor Q.		

Question 11: Time: 1 Min 19 Sec Marks: 0 / 0.7

You are given the postorder traversal, P, of a binary search tree on the n elements 1, 2, ..., n. You have to determine the unique binary search tree that has P as its postorder traversal. What is the time complexity of the most efficient algorithm for doing this?

Options	Response	Answer
O(log n).		
O(n).		•
O(nlogn).	•	
None of the above.		

Question 12: Time: 5 Min 6 Sec Marks: 0.7 / 0.7

If the in-order and preorder traversal of a binary tree are D, B, F, E, G, H, A, C and A, B, D, E, F, G, H, C respectively then the post-order traversal of that tree is

Options	Response	Answer
D, F, G, A, B, C, H, E		
F, H, D, G, E, B, C, A		
C, G, H, F, E, D, B, A		
D, F, H, G, E, B, C, A	•	•

 Question 13:
 Time: 1 Min 27 Sec
 Marks: 0.7 / 0.7

If the given input array is sorted or nearly sorted, which of the following algorithm gives the best performance?

Options	Response	Answer
Merge sort		
Quick sort		
Selection sort		
Insertion sort	•	•

Question 14:	Time: 2 Min 27 Sec	Marks: 0.7 / 0.7

Which one of the following is a key factor for preferring B-trees to binary search trees for indexing database relations?

Options	Response	Answer
Database relations have a large number of records.		
Database relations are sorted on the primary key.		
B-trees require less memory than binary search trees.		
Data transfer form disks is in blocks.	•	•

Question 1: Time: 4 Min 23 Sec Marks: 0 / 0.7	
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Which of the following algorithm allows negative edge weight in a graph?

Options	Response	Answer
Dijkstra's algorithm		
Bellman ford algorithm	•	
Kruskal's algorithm		
Prim's algorithm		•

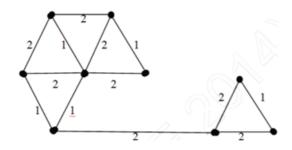
Question 1: Time: 41 Sec Marks: 0 / 0.7

Choose the correct statement for a given B+ Tree.

Options	Response	Answer
B + tree allows rapid random access as well as rapid sequential access	<b>✓</b>	
B + tree allows only the rapid sequential access		
B + tree allows only the rapid random access		
B + tree allows rapid random access and slower sequential access		•

**Question 2:** Time: 5 Min 23 Sec Marks: 0.7 / 0.7

The number of distinct minimum spanning trees for the weighted graph below is:



Options	Response	Answer
6	•	<b>✓</b>
5		
8		
none of the above		

Question 3: Time: 6 Min 59 Sec Marks: 0 / 0.7

Options	Response	Answer
2 <sup>T</sup> -1		
2 <sup>T -1</sup> + 1		•
2 <sup>T-1</sup>	•	
2 <sup>T</sup> +1		

Question 1:	Time: 22 Sec	Marks: 0.7 / 0.7
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If a problem requires searching from a set or ask for an optimal solution, then which of the following approaches would yield best results?

Options	Response	Answer
Backtracking	<b>✓</b>	✓
Greedy approach		
Dynamic approach		
None of the above		

Question 2: Time: 15 Sec Marks: 0 / 0.7

Which of the following cannot be solved by Greedy algorithm?

Options	Response	Answer
Travelling Salesman Problem	<b>✓</b>	
Prim's Minimal Spanning Tree Algorithm		
Kruskal's Minimal Spanning Tree Algorithm		
Floyd Warshall algorithm		•

Question 3: Time: 49 Sec Marks: 0 / 0.7

Which of the following strategies do not directly invoke recursion?

Options	Response	Answer
backtracking	•	
divide and conquer		
dynamic programming		
all of the above		<b>✓</b>

Question 4:	Time: 1 Min 51 Sec	Marks: 0.7 / 0.7	
<b>4</b>	1111C: 1 WIII 01 000	Marks. 0.1 / 0.1	

If all edges have the same weight in an undirected graph, which algorithm will find the shortest path between two nodes more efficiently?

Options	Response	Answer
Dijkstra		
Bellman-Ford		
Depth-First Search		
Breadth-First Search	•	•

Question 1: Time: 1 Min 44 Sec

Marks: 0.7 / 0.7

Consider two strings X = ``A B A C C'' and Y = ``B A B C A C B''. Let m be the length of the longest common subsequence (not necessarily contiguous) between X and Y and let n be the number of such longest common subsequence between A and B. Then  $m + 10 \times n = \underline{\hspace{1cm}}$ .

Options	Response	Answer
53		
43		
44		
34	•	•

Question 2: Time: 2 Min 53 Sec Marks: 0 / 0.7

Hibonacci, an alleged relative of Fibonacci, devises the following series:

$$f(n) = f(n-1) \times f(n-2)$$
,  $f(1) = 2$  and  $f(2) = 3$ 

He intends to calculate the sum of the first n terms of the above series. What would be the complexity if dynamic programming is used to accomplish the task.

Options	Response	Answer
O(n)		<b>✓</b>
O(n <sup>2</sup> )	•	
O(n <sup>3</sup> )		
None of the above		

Question 3: Time: 52 Sec Marks: 0 / 0.7

What would be the complexity of finding a sequence of elements which has maximum

Options	Response	Answer
O(n)	•	
O(n <sup>2</sup> )		
O(n <sup>3</sup> )		<b>✓</b>
None of the above		

Ouestion 4:	Time: 1 Min 46 Sec	Marks: 0.7 / 0.7

With reference to Knuth-Morris-Pratt string matching algorithm, which one of the following is the prefix function ( $\Pi$ ) of a pattern " a b a b a c a "

Options	Response	Answer
0012301	•	•
0001230		
0012001		
0010123		

Question 5:	Time: 1 Min 29 Sec	Marks: 0 / 0.7
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A graph is given with 100 nodes (representing places in a city), where each node is connected with all other nodes in the graph along with the weights of the edges (representing distances between any two places in the city). It is required to lay down the water pipeline (by placing minimum length of pipes) to serve the water to all the nodes/places in the graph/city. Certainly, one is required to identify the Minimum Spanning Tree (MST) for the given graph such that minimum pipe lengths required can be identified. Which one of the following algorithm will apply to identify the MST?

Options	Response	Answer
Kruskal's algorithm implemented using union find data-structure	<b>✓</b>	
Prim's algorithm implemented using Heap		<b>✓</b>
Kruskal's algorithm implemented without using union find data-structure		
None of the above		

Question 1:	Time: 34 Sec	Marks: 0.7 / 0.7

If a graph has n vertices and there are m colours to be filled, which of the following is the correct complexity of graph colouring problem?

Options	Response	Answer
O (mm <sup>n</sup> )		
O (nm <sup>n</sup> )	•	•
O (nn <sup>n</sup> )		
None of the above		

Question 2: Time: 24 Sec Marks: 0.7 / 0.7

Which of the following are constraints of an N-Queens problem? If a queen has already been placed at (x, y) then the other is to be placed at (m, n) This can be done provided

Options	Response	Answer
x≠m		
y≠n		
y-n  =  x -m		
All of the above	•	•

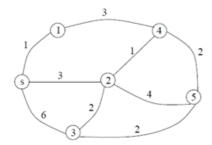
Question 3: Time: 1 Min 18 Sec Marks: 0.7 / 0.7

Subset sum problem is to find subset of elements that are selected from a given set whose sum adds up to a given number. What is the complexity of the subset sum problem via brute force?

Options	Response	Answer
O (n2 <sup>n</sup> )		
O (2 <sup>n</sup> )	•	•
O ( n <sup>2</sup> )		
None of the above		

Question 4: Time: 1 Min 53 Sec Marks: 0 / 0.7

Consider the graph below. Assume that we use Dijkstra's algorithm to find shortest paths from vertex S to the other vertices in the graph. In which order are the shortest paths computed?



Options	Response	Answer
S, 1, 2, 3, 4, 5		
S, 1, 2, 4, 5, 3		
S, 1, 4, 2, 3, 5	•	
S, 1, 2, 4, 3, 5		•

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	IDETIAN	

Time: 3 Min 57 Sec

Marks: 0 / 0.7

The postfix form of A  $^A$  B  $^*$  C - D + E/ F/ (G + H),

Options	Response	Answer
AB^C*D-EF/GH+/+		•
AB^CD-EP/GH+/+*		
ABCDEFGH+//+-*^	•	
AB^D +EFGH +//*+		

Question 2: Time: 2 Min 15 Sec Marks: 0 / 0.7

Let C(t) be the number of leaves in a binary tree rooted at t. Assume that isLeaf(t) returns 1 if t is a leaf and 0 otherwise. Which of the following observations leads to a recursive implementation?

Options	Response	Answer
C(t)=C(t->left)+C(t->right)	•	
C(t)=C(t->left)+C(t->right)+1		
C(t)=C(t->left)+C(t->right)+isLeaf(t)		<b>✓</b>
C(t)=C(t->left)+C(t->right)+isLeaf(t)+1		

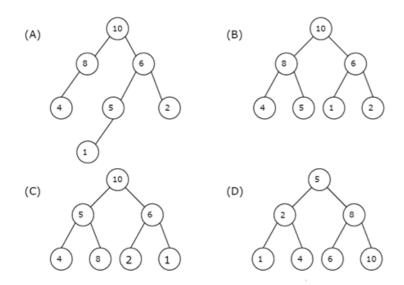
Question 3: Time: 27 Sec Marks: 0 / 0.7

How many distinct binary search trees can be created out of 3 distinct keys (using all 3 nodes)?

Options	Response	Answer
5		<b>✓</b>
4		
6	•	
27		

Question 4: Time: 11 Sec Marks: 0.7 / 0.7

Which one of the followings is a max-heap:



Options	Response	Answer
A and B		
В	•	•
A, B and C		
A and C		

Question 5: Time: 18 Sec Marks: 0 / 0.7

Consider a B-tree of order 4 and is built from scratch by 10 successive insertions. What would be the maximum number of node splitting operations that take place?

Options	Response	Answer
3		
4		•
6	•	
2		

**Question 6:** Time: 19 Sec Marks: 0.7 / 0.7

Options	Response	Answer
just build the tree with the given input		
find the median of the set of elements given, make it as root and construct the tree	<b>✓</b>	<b>✓</b>
use trial and error		
use dynamic programming to build the tree		

 Question 7:
 Time: 40 Sec
 Marks: 0.7 / 0.7

Consider an implementation of unsorted singly linked list. Suppose it has its representation with a head pointer only. Given the representation, which of the following operation can be implemented in O(1) time?

- i) Insertion at the front of the linked list
- ii) Insertion at the end of the linked list
- iii) Deletion of the front node of the linked list
- iv) Deletion of the last node of the linked list

Options	Response	Answer
I and II		
I and III	•	•
I, II and III		
I, II and IV		

Question 1:

Time: 4 Min 25 Sec

Marks: 0 / 0.7

The following items are inserted into an AVL tree: 1, 2, 3, 8, 6. How many rotations are performed?

Options	Response	Answer
no rotations	•	
1 single rotation only		
1 double rotation only		
1 single rotation and 1 double rotation		•

Question 2:

Time: 33 Sec

Marks: 0.7 / 0.7

Consider a complete undirected graph with vertex set  $\{0, 1, 2, 3, 4\}$ . Entry Wij in the matrix W below is the weight of the edge  $\{i, j\}$ .

$$W = \begin{pmatrix} 0 & 1 & 8 & 1 & 4 \\ 1 & 0 & 12 & 4 & 9 \\ 8 & 12 & 0 & 7 & 3 \\ 1 & 4 & 7 & 0 & 2 \\ 4 & 9 & 3 & 2 & 0 \end{pmatrix}$$

What is the minimum possible weight of a spanning tree T in this graph such that vertex 0 is a leaf node in the tree T?

Options	Response	Answer
7		
8		
9		
10	•	•

Question 3:

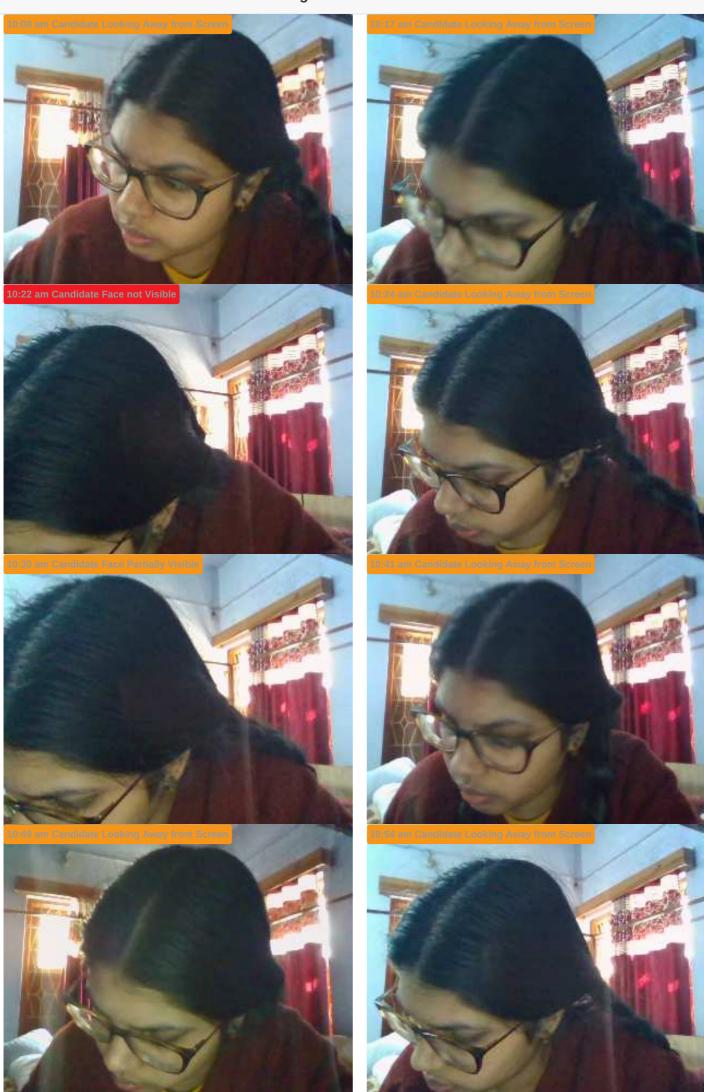
Time: 1 Min 49 Sec

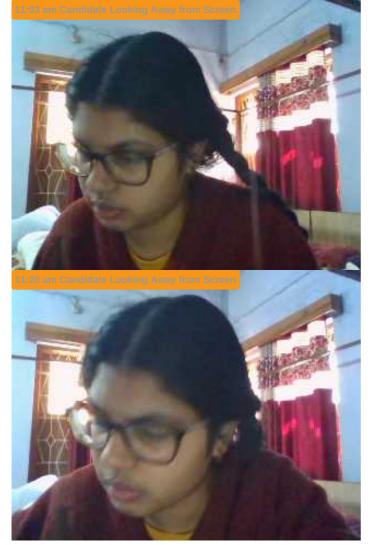
Marks: 0.7 / 0.7

Options	Response	Answer
a single rotation between some node and its left child is performed		
a single rotation between some node and its right child is performed	•	•
a double rotation with a node, its left child, and a third node is performed		
a double rotation with a node, its right child, and a third node is per formed		

# Test Log

# Images of the test taker







#### 18 Dec,2020

10:05 am	Candidate submitted the Registration details for Authorization
10:06 am	ALOK PRATAP SINGH CHAUHAN authorized the candidate
10:06 am	Started the test with Section #1
10:06 am	Candidate gave us right to the following feeds
	- camera
	- microphone
10:08 am	Candidate Looking Away from Screen
10:09 am	Candidate Looking Away from Screen
10:10 am	Candidate Looking Away from Screen
10:17 am	Candidate Looking Away from Screen
10:18 am	Went to Section #2 of the test
10:18 am	Candidate Face Partially Visible
10:19 am	Candidate Looking Away from Screen
10:19 am	Candidate Face Partially Visible
10:20 am	Candidate Looking Away from Screen
10:22 am	Candidate Face not Visible
10:24 am	Candidate Looking Away from Screen
10:25 am	Candidate Looking Away from Screen
10:30 am	Candidate Face Partially Visible
10:31 am	Candidate Looking Away from Screen
10:31 am	Candidate Face Partially Visible
10:33 am	Candidate Face Partially Visible
10:33 am	Candidate Looking Away from Screen
10:34 am	Candidate Looking Away from Screen
10:35 am	Candidate Face Partially Visible
10:36 am	Candidate Face Partially Visible
10:36 am	Candidate Looking Away from Screen
10:37 am	Candidate Face Partially Visible
10:37 am	Candidate Looking Away from Screen
10:41 am	Candidate Looking Away from Screen
10:42 am	Went to Section #3 of the test
10:42 am	Candidate Face Partially Visible
10:42 am	Went to Section #2 of the test
10:43 am	Went to Section #3 of the test
10:44 am	Went to Section #4 of the test
10:47 am	Went to Section #3 of the test
10:48 am	Went to Section #2 of the test
10:48 am	Went to Section #4 of the test
10:49 am	Candidate Looking Away from Screen
10:50 am	Went to Section #5 of the test
10:53 am	Went to Section #6 of the test
10:53 am	Candidate Looking Away from Screen
10:54 am	Candidate Looking Away from Screen
10:59 am	Went to Section #7 of the test
11:00 am	Candidate Looking Away from Screen
11:01 am	Candidate Looking Away from Screen
11:03 am	Went to Section #8 of the test
11:03 am	Candidate Looking Away from Screen for 01 min
11:06 am	Candidate Looking Away from Screen
11:09 am	Candidate Looking Away from Screen
11:11 am	Candidate Looking Away from Screen
11:11 am	Went to Section #9 of the test
11:11 am	Went to Section #1 of the test
11:12 am	Candidate Looking Away from Screen
11:13 am	Went to Section #2 of the test

11:13 am	Candidate Looking Away from Screen
11:16 am	Went to Section #3 of the test
11:17 am	Candidate Face Partially Visible
11:18 am	Went to Section #4 of the test
11:20 am	Candidate Looking Away from Screen
11:22 am	Candidate Face Partially Visible
11:26 am	Candidate Face Partially Visible
11:26 am	Went to Section #5 of the test
11:26 am	Went to Section #6 of the test
11:28 am	Went to Section #7 of the test
11:29 am	Went to Section #8 of the test
11:29 am	Went to Section #9 of the test
11:30 am	Candidate Looking Away from Screen
11:32 am	Went to Section #1 of the test
11:32 am	Went to Section #9 of the test
11:35 am	Went to Section #2 of the test
11:35 am	Went to Section #5 of the test
11:36 am	Went to Section #6 of the test
11:36 am	Went to Section #8 of the test
11:36 am	Went to Section #9 of the test
11:36 am	Test ended due to time over