

3.

You begin work on the exam, you will have 2:30 hours to complete it. Be sure to leave extra time at the end to check your answers. Internet connectivity issues or computer issues are not an acceptable reason to submit late. No late exams will be accepted. Please be aware that multiple choice questions may have multiple correct answers. Choose all answers that are correct.

### Question 3

Which of the following is true about linked list implementation of stack?

- In push operation, if new nodes are inserted at the beginning of linked list, then in pop operation, nodes must be removed from end.
- Neither answer is correct
- In push operation, if new nodes are inserted at the end, then in pop operation, nodes must be removed from the beginning.

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Not covered

Can't answer

DELL

Which of the following is true about linked list implementation of stack?

- (A) In push operation, if new nodes are inserted at the beginning of linked list, then in pop operation, nodes must be removed from the end.
- (B) In push operation, if new nodes are inserted at the end, then in pop operation, nodes must be removed from the beginning.
- (C) Both of the above
- (D) None of the above

**Answer: NONE**

**Explanation:** To keep the Last In First Out order, a stack can be implemented using linked list in two ways:

- a) In push operation, if new nodes are inserted at the beginning of linked list, then in pop operation, nodes must be removed from beginning.
- b) In push operation, if new nodes are inserted at the end of linked list, then in pop operation, nodes must be removed from end.

4.

The exam is individual work; do not work with any other person on the exam. You may refer to the internet and notes, but you code editor or a compiler/interpreter during the exam. You also may not search the web for problems similar to those asked in the exam.

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□ Question 4 10

When must a dynamically-resizing random-access sequential container, such a vector, reallocate memory?

- Every time the user resizes the container
- Every time data is inserted
- When the desired size exceeds the reserved capacity
- When new data is added anywhere other than the end

DELL

Answer: When the desired size exceeds the reserved capacity.

Reallocation invalidates(使无效) all the references, pointers, and iterators referring to the elements in the sequence. It is **guaranteed that no reallocation takes place** during insertions that happen after a call to `reserve()` until the time when an insertion would make the size of the vector greater than the size specified in the most recent call to `reserve()`.

5.

be aware that multiple choice questions may have multiple correct answers. Choose all answers that are correct.

### Question 5

Which of the following is a difference between partially ordered and properly ordered binary trees?

- Partially ordered trees are always balanced whereas properly ordered trees are not guaranteed to be balanced
- All nodes in a partially ordered tree will be either greater or less than their parent whereas in a properly ordered tree one specific child is greater than the parent and the other child is always less than the parent
- Partially ordered trees are complete whereas properly ordered trees are not
- Properly ordered trees are complete whereas partially ordered trees are not
- Properly ordered trees are always balanced whereas partially ordered trees are not guaranteed to be balanced

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??? Properly ordered

Properly ordered trees are complete whereas partially ordered trees are not.

6.

You may use a calculator during the exam. You also may not search the web for problems similar to those asked.

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### Question 6

Why can a complete binary tree be stored in a random-access sequential container, such as an array?

- There are no gaps in the tree and moving between parent and child can be done using a mathematical relationship between them.
- The number of nodes in a complete binary tree will always increase exponentially as new data is added.
- All trees can be modeled using an array.

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No gaps in the tree and moving between parent and child can be done

7.

Please be aware that multiple choice questions may have multiple correct answers. Choose all answers that are correct.

### Question 7

Which of the following are suitable for use as a vector's reallocation strategy where  $C$  is the existing capacity and  $S$  is the desired size? You can assume that the vector never shrinks.

$\max(C^2, S^2)$

$\max(C, S)$

$C + 1$

$S$

$\max(C+1, S)$

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Max( $c^2, s^2$ )

8.

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### Question 8

Which of the following statements are true with regard to slotted trees?

- Either none or all slots must be filled with children
- Every node has a fixed number of possible children
- Each child occupies a specific slot in the parent
- Every node has a varying number of slots

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Not saved

Every node has a varying number of slots

9.

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### Question 9

Which of the following points is/are true about linked list data structure when it is compared with vector?

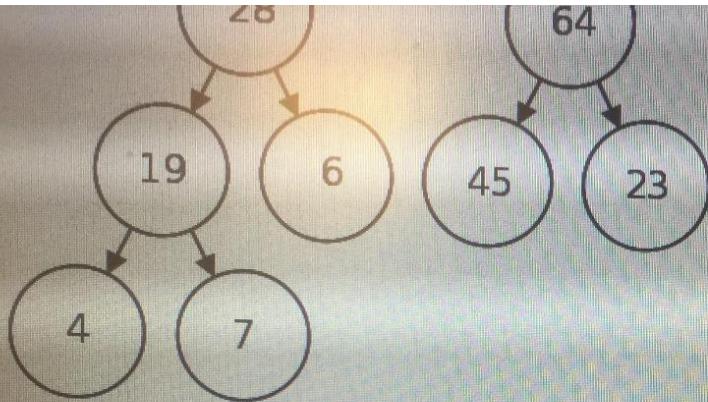
- Random access is not allowed in a typical implementation of linked lists
- It is more efficient to insert and delete elements in linked list when compared to a vector
- The size of a vector has to be pre-decided, linked lists can change their size any time.

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Not saved

All correct

10.



Describe the process of inserting the number 32 into this max-heap.

- 32 becomes the left child of 6, flips with 6, flips with 28, and ends up as the left child of 99
- 32 becomes the left child of 45
- 32 becomes the right child of 99, with 64 as its left child
- 32 becomes the left child of 23, flips with 23, and ends up as the right child of 64

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32 becomes left child of 6 then flips and flips

11.

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### Question 11

When might you use a sequential search rather than a binary search?

- Sequential search is faster than binary search
- The data structure being searched does not allow random access
- The stored data is not in sorted order
- The data is stored in descending order

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Binary has to allow random access

Binary has to be in sorted order

12.

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### Question 12

The inorder and preorder traversal of a binary tree are d b e a f c g and a b d e c f g, respectively. The postorder traversal of the binary tree is:

- d e b f g c a
- e d b g f c a
- e d b f g c a
- d e f g b c a

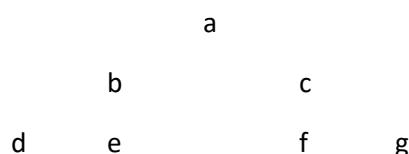
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Not saved

In-order (Left, Root, Right)

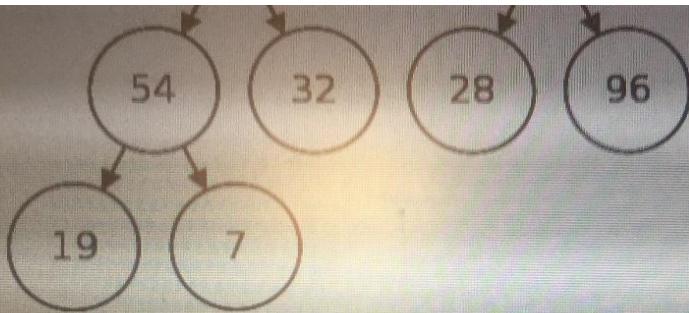
Pre-order (Root, Left, Right)

Post-order (Left, Right, Root)



Post-order d e b f g c a

13.



Which nodes are not in the correct location in this max-heap?

- 32
- 64
- 96
- 54
- 99
- 28
- 42
- 19

Max-heap, not in correct, 96, the right child too big.

14.

Please be aware that multiple choice questions may have multiple correct answers. Choose all answers that are correct.

### Question 14

```
function fun1(head: Node) {  
    if(!head) return;  
    fun1(head.next);  
    console.log(head.data);  
}
```

What does this code do?

- Prints alternate nodes of Linked List
- Prints all nodes of linked lists
- Prints all nodes of linked list in reverse order
- Prints alternate nodes in reverse order

If(!head) return;

Print all nodes of linked list in reverse order

15. ???

code editor or a compiler/interpreter during the exam. You also may not search the web for problems since you will be working individually.

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### Question 15

Which of the following statements are true about binary trees?

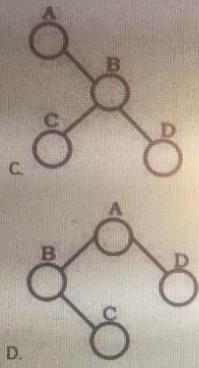
- Slots are assigned as left and right
- They are a type of slotted tree
- If a node has only one child, the child is always the left child
- Binary trees can always be stored in a vector

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Slots are assigned left and right

They are a type of slotted tree

16.



Which one of the above binary trees has its inorder and preorder traversals as BCAD and ABCD, respectively?

- C
- B
- D
- A

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In-order (Left, Root, Right)

Pre-order (Root, Left, Right)

Post-order (Left, Right, Root)

D.

17.

submit; Internet connectivity issues or computer issues are not an acceptable reason to submit late. No late submissions will be accepted.

Please be aware that multiple choice questions may have multiple correct answers. Choose all answers that apply.

### Question 17

When can a binary tree be stored in an array?

- When it is properly ordered
- When it is full
- When it is complete
- When it is partially ordered
- When it is balanced

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When properly ordered

When balanced

18.

Please be aware that multiple choice questions may have multiple correct answers. Choose all answers that

### Question 18

```
function fun( root: Node ) {  
    if( !root ) return 0;  
    if ( !root.left && !root.right ) return 0;  
    return 1 + fun( root.left ) + fun( root.right );  
}
```

What does the above function do for a given binary tree?

- Returns height where height is defined as number of edges on the path from root to deepest node
- Counts internal nodes
- Return diameter where diameter is number of edges on the longest path between any two nodes.
- Counts leaf nodes

Counts internal nodes

19.

□ Question 19

0	
1	
2	42
3	23
4	34
5	52
6	46
7	33
8	
9	

A hash table of length 10 uses open addressing with hash function  $h(k) = k \bmod 10$ , and linear probing ( $k+1$ ). After inserting 6 values into an empty hash table, the table is as shown above.

Which one of the following choices gives a possible order in which the key values could have been inserted?

- 46, 34, 42, 23, 52, 33
- 34, 42, 23, 52, 33, 46
- 46, 42, 34, 52, 23, 33

46 34 42 23 52 33

20.

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## Question 20

Which of the following are scenarios that could result in an unbalanced binary search tree?

- Inserting data that is randomly distributed
- Inserting data that is sorted in ascending order
- Inserting data that is sorted in descending order

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All 3

21.

Please be aware that multiple choice questions may have multiple correct answers. Choose all answers that



### Question 21

Which of the following is a true statement about Binary Trees?

- No binary tree is both complete and full.
- Every full binary tree is also a complete binary tree.
- Every binary tree is either complete or full.
- Every complete binary tree is also a full binary tree.

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None is correct

22.

Please note that it may take up to 24 hours to complete it. Be sure to leave extra time to submit; internet connectivity issues or computer issues are not an acceptable reason to submit late. Please be aware that multiple choice questions may have multiple correct answers. Choose all answers.

### Question 22

How many stacks are required to implement a queue. Consider the situation where no other list is available to you.

- 1
- 2
- 3
- 4

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2

23.

Please be aware that multiple choice questions may have multiple correct answers. Choose all answers that apply.



### Question 23

```
function fun(start: Node) {  
    if(!start) return;  
    console.log(start.data);  
    if(start.next) fun(start.next.next);  
    console.log(start.data);  
}
```

What is the output of following function for start pointing to first node of following linked list?

1->2->3->4->5->6

135135

135531

1235

146641

135531

24.

## Question 24

Which of these definitions describes a full binary tree?

- A tree with height  $H$  will have  $2^{(H-1)}$  nodes
- Nodes must always have 2 children
- The tree is complete
- A tree with height  $H$  will have  $2^H - 1$  nodes
- Nodes must be smaller than their parent

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$2^H - 1$  correct

25.

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### Question 25

A program P reads in 432 integers in the range [0..100] representing the scores of 432 students. It is required to store the frequencies of each score above 60. What would be the best way for P to store the frequencies?

- A array of 100 numbers
- An array of 40 numbers
- An array of 432 numbers
- A dynamically allocated array of 472 numbers

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Frequency store array 40.

26.

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### Question 26

What is common in three different types of traversals (Inorder, Preorder and Postorder)?

- Root is visited before right subtree
- Root is visited after left subtree
- Left subtree is always visited before right subtree

DELL

Correct

In-order (Left, Root, Right)

Pre-order (Root, Left, Right)

Post-order (Left, Right, Root)

27.

Commit, Internet connectivity issues or computer issues are not an acceptable reason to submit late. No late entries will be accepted.

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## Question 27

What are some of the benefits of implementing an iterator?

- A uniform pattern for iterating through any container regardless of how its implemented
- Some containers can not be randomly accessed and the iterator can store the current position in the data structure
- Iterators can be used to treat non-sequential data structures as sequential for the purpose of iterating through them
- Iterators are more efficient than randomly accessing data

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Correct