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|-----|--|---|---|---|
| 9.  | In linked list implementation of a queue, front and rear pointers are tracked. Which of these pointers will change during an insertion into a NONEMPTY queue?  | 1 | 1 | 3 |
|     | (A) Only front pointer (B) Only rear pointer   |   |   |   |
|     | (C) Both front and rear pointer (D) No pointer will be changed   |   |   |   |
| 10. | What happens when you try to pop an element from an empty Stack?   | 1 | 1 | 3 |
|     | (A) It returns null (B) It returns the top element   |   |   |   |
|     | (C) It causes an underflow (D) It causes an overflow   |   |   |   |
| 11. | Which of the following applications may not use a Stack?   | 1 | 1 | 3 |
|     | (A) Recursion (B) Parsing  |   |   |   |
|     | (C) Browser history (D) Tatkal Ticket Booking in IRCTC   |   |   |   |
| 12. | If the elements "A", "B", "C" and "D" are placed in a queue and are deleted one at a time, in what order will they be removed?   | 1 | 4 | 3 |
|     | (A) ABCD (B) DCBA  |   |   |   |
|     | (C) DCAB (D) AAAA  |   |   |   |
| 13. | Binary tree with only left child node is called as   | 1 | 1 | 4 |
|     | (A) Left-skewed binary tree (B) Right binary tree  |   |   |   |
|     | (C) Right-skewed binary tree (D) Left binary tree  |   |   |   |
| 14. | Select the correct definition for balancing factor of a tree   | 1 | 1 | 4 |
|     | (A) Difference between left subtree and right subtree (B) Difference between leaf node and non-leaf node   |   |   |   |
|     | (C) Difference between root and degree of a tree (D) Difference between height and depth of a tree   |   |   |   |
| 15. | The following numbers are inserted into an empty binary search tree in the given order: 10, 1, 3, 5, 15, 12, 16. What is the height of the binary search tree?   | 1 | 3 | 4 |
|     | (A) 2 (B) 3  |   |   |   |
|     | (C) 4 (D) 6  |   |   |   |
| 16. | In Binary tree traversing visiting the root node first, then left sub tree and right sub tree is called _____  | 1 | 1 | 4 |
|     | (A) Inorder (B) Preorder   |   |   |   |
|     | (C) Postorder (D) Levelorder   |   |   |   |
| 17. | What can be the value of m in the division method?   | 1 | 1 | 5 |
|     | (A) Any prime number (B) Any even number   |   |   |   |
|     | (C) $2^p - 1$ (D) $2^p$  |   |   |   |
| 18. | Using division method, in a given hash table of size 157, the key of value 172 be placed at position _____   | 1 | 3 | 5 |
|     | (A) 19 (B) 72  |   |   |   |
|     | (C) 15 (D) 17  |   |   |   |
| 19. | A person wants to visit some places. He starts from a vertex and then wants to visit every vertex till it finishes from one vertex, backtracks and then explore other vertex from same vertex. What algorithm he should use? | 1 | 3 | 5 |
|     | (A) Depth First Search (B) Breadth First Search  |   |   |   |
|     | (C) Prim's algorithm (D) Kruskal's Algorithm   |   |   |   |
| 20. | Dijkstra algorithm is also called the _____ shortest path problem.   | 1 | 1 | 5 |
|     | (A) multiple source (B) single source  |   |   |   |
|     | (C) single destination (D) multiple destination  |   |   |   |

**PART - B ( $5 \times 4 = 20$  Marks)**

Answer **any 5** Questions

Marks BL CO

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|-----|--|---|---|---|
| 21. | Narrate how binary search works for searching the element 5 in the following input 2,3,5,10,61,75,80? Mention its time complexity. | 4 | 4 | 1 |
|-----|--|---|---|---|

22. Find the upper bound of running time of quadratic function $f(n) = 3n^2 + 2n + 4$ ; $g(n) = O(n^2)$ .	4	5	1
23. What is Circular Linked List? How it differs from singly linked list?	4	4	2
24. What kind of linked list can apply to solve Joseph Problem? Give example.	4	2	2
25. Outline the procedure for towers of Hanoi using stack data structure.	4	2	3
26. Underline the term AVL trees? Describe the different rotations defined on AVL tree.	4	2	4
27. Give algorithm/pseudocode for DFS. Demonstrate DFS using suitable example.	4	3	5

**PART - C ( $5 \times 12 = 60$  Marks)**

Answer all Questions

Marks BL CO

28. (a) Show all the passes using insertion sort for the following list 54,26,93,17,77,31,44,55,20	12	1	1
(OR)			
(b) Write C program/algorithm to perform linear search. Find the time complexity for best, worst and average case for a linear search in an array of n elements.			
29. (a) Interpret the procedure on how to delete a node from a linked list with an example and relevant diagrams.	12	1	2
(OR)			
(b) State the term array and analyze the various ADT operations on array.			
30. (a) Convert the following expression into its corresponding post fix form using the prescribed algorithm: $(300+23)*(43-21)/(84+7)$ . Do the evaluation of resultant postfix expression.	12	1	3
(OR)			
(b) Explain the operations and the implementation of Queue ADT using Array			
31. (a) Manipulate preorder, inorder and postorder traversal on a binary tree with an algorithm and an example.	12	1	4
(OR)			
(b) Apply the binary search tree property and write the algorithm to search a binary tree with an example.			
32. (a) Elaborate the steps in the Dijkstra's shortest path algorithm with an example.	12	1	5
(OR)			
(b) Consider a hash table of size 7 and hash function $h(k) = k \bmod 7$ . Draw the table that results after inserting in the given order, the following values. 19,26,13,48,17 for each of the three scenarios.			
a) When collisions are handled by separate chaining.			
b) When collisions are handled by linear probing.			
c) When collisions are handled by double hashing using second hash function $h' = 5 - (5 \bmod k)$ .			

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