

- b. Illustrate the bubble sort technique for the given data and write the pseudo code and mention its worst case time complexity.
33 54 8 57 12 62 7 73

29. a. Write an pseudo code to insert a node '74' at the beginning, at any position and at the end of the single linked list. Give a pictorial representation of single linked list before and after insertion.
12 76 33 47 23

(OR)

- b. Write the pseudo code for inserting an element in the beginning of an array and for traversing an array with examples.
30. a. Convert the following expression from infix to postfix.
(i) $(a-b)*(c-d)-(d*e)$
(ii) $a-(b/c+(d\%e*f)/g)*h$

(OR)

- b. Write the pseudo code to insert and delete an element in a circular queue with example.
31. a. Construct a AVL tree and explain all the rotations with the given data.
49 13 9 52 69 73 54 16 23 44 39

(OR)

- b. Construct the binary search tree using the following elements.
45 39 56 12 35 78 32 10 89 82
Find in-order, pre-order and post-order traversal of the same tree.

32. a. Describe the implementation of Dijkstra's algorithm with an example.

(OR)

- b. What is hashing? Explain in detail about mid-square method and modulo-division method with example.

Reg. No.

B.Tech. DEGREE EXAMINATION, JUNE 2023
Third & Fourth Semester

18CSC201J – DATA STRUCTURES AND ALGORITHMS
(For the candidates admitted during the academic year 2018-2019 to 2021-2022)

Note:

- (i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.
(ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours

Max. Marks: 100

PART – A (20 × 1 = 20 Marks)

Answer ALL Questions

- | | Marks | BL | CO | PO |
|---|-------|----|----|----|
| 1. What is the best case time complexity of the insertion sort algorithm?
(A) $O(n)$ (B) $O(n \log n)$
(C) $O(n^2)$ (D) $O(2^n)$ | 1 | 1 | 1 | 1 |
| 2. In bubble sort, how many passes are required to sort 'n' elements in the worst case?
(A) $n-1$ (B) n
(C) $n+1$ (D) $n(n-1)/2$ | 1 | 1 | 1 | 1 |
| 3. In linear search algorithm, what is the input data structure?
(A) Array (B) Linked list
(C) Tree (D) Graph | 1 | 1 | 1 | 1 |
| 4. Which of the following notations represents a lower bound on the running time of an algorithm?
(A) O -notation (B) Ω -notation
(C) θ -notation (D) γ -notation | 1 | 1 | 1 | 1 |
| 5. What is the index of the first element in an array in C?
(A) 0 (B) 1
(C) -1 (D) 2 | 1 | 1 | 2 | 1 |
| 6. What is a node in a linked list?
(A) A pointer to the next node in the list (B) A pointer to the previous node in the list
(C) A data structure that contains data and a pointer to the next node in the list (D) A data structure that contains data only | 1 | 1 | 2 | 1 |
| 7. What is the time complexity of searching for a node in a linked list?
(A) $O(1)$ (B) $O(n)$
(C) $O(\log n)$ (D) $O(n^2)$ | 1 | 1 | 2 | 2 |

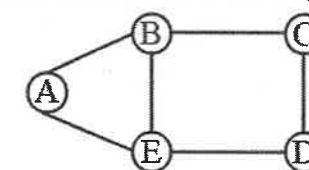
8. The sparse matrix triplet method is most efficient when _____.
 (A) The matrix has very few non-zero elements (B) The matrix is symmetric
 (C) The matrix is diagonal (D) The matrix is dense
9. What is the term used to describe the insertion operation on a queue?
 (A) Push (B) Enqueue
 (C) Pop (D) Dequeue
10. What happens when we try to pop an element from an empty stack?
 (A) New value is returned (B) A default value is returned
 (C) The stack remains empty (D) The program crashes
11. Which of the following is true about a priority queue?
 (A) It operates on a FIFO principle (B) It operates on a LIFO principle
 (C) It stores element in a random order (D) It orders elements based on their priority
12. In a stack, if a user tries to remove an element from an empty stack it is called _____.
 (A) Under flow (B) Over flow
 (C) Empty collection (D) Garbage
13. The number of edges from the node to the deepest leaf is called _____ of the tree.
 (A) Height (B) Depth
 (C) Length (D) Width
14. If each node has exactly zero or two children, called as _____.
 (A) Full binary tree (B) Half binary tree
 (C) Zero binary tree (D) Quarter binary tree
15. In a full binary tree, if the number of internal nodes is I, then the number of nodes N are?
 (A) $N = 2L$ (B) $N = L + 1$
 (C) $N = L - 1$ (D) $N = 2L - 1$
16. What is the salient feature about the inorder traversal of a binary search tree?
 (A) It traverses in a non-increasing order (B) It traverses in an increasing order
 (C) It traverses in a random fashion (D) It traverses based on priority of the node
17. A path that begins and ends at the same node is _____.
 (A) Cycle (B) Path
 (C) Degree (D) Link

18. Hash table is _____.
 (A) A structure that maps values to keys (B) A structure that maps keys to values
 (C) A structure used for storage (D) A structure used to implement stack
19. Load factor is _____.
 (A) Average array size (B) Average key size
 (C) Average chain length (D) Average hash table length
20. Dijkstra's algorithm is used for which type of problems?
 (A) Shortest path problem in weighted graph (B) Shortest path problem in unweighted graph
 (C) Longest path problem in unweighted graph (D) Longest path problem in weighted graph

PART – B (5 × 4 = 20 Marks)

Answer ANY FIVE Questions

21. Distinguish the characteristics of Big Oh, Big Omega and theta notations.
22. Analyze the time complexity of insertion sort.
23. Write an algorithm for deletion of an node at the beginning of the single linked list.
24. For the given matrix, find the sparse triplet matrix and transpose it.
25. Define dequeue. How it is represented? What are the types of dequeue?
26. Construct the binary search tree with following elements.
 47, 36, 57, 10, 34, 73, 30, 9, 91, 56, 69, 82
27. Consider the graph given below and find the degree of each node.



PART – C (5 × 12 = 60 Marks)

Answer ALL Questions

28. a. In a given array of 10 numbers the data 35 need to be found using linear search algorithm.
 4 8 10 17 28 33 45 35 91 97
 Write the C program for the same.

(OR)