

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS :NOVEMBER 2024

BSC CS WITH AI & ML

MAXIMUM MARKS: 75

SEMESTER: I

TIME: 3 HOURS

PART - III

24UAI102 – DATA STRUCTURES AND APPLICATIONS

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS. (K1)

1. Identify the term that describes the order of operations in an algorithm_____.

A) Sequence B) Condition C) Iteration D) Recursion

2. Choose the right applications that commonly use stacks_____.

A) Memory management B) File systems
C) Recursion handling D) Sorting algorithms

3. Identify the following that is true about a binary tree_____.

A) Each node has at most one child. B) Each node has at most two children.
C) Each node has at most three children. D) Each node has at least one child.

4. In Bubble Sort, how many elements are compared in each iteration?

A) Two B) Three C) Four D) One

5. Choose the following that describes the basic idea behind the Transpose Sequential Search algorithm_____.

A) Moving the found element to the beginning of the list
B) Swapping the found element with its predecessor
C) Rearranging the entire list after each search
D) Searching the list in reverse order

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES (K2)

6. List any three common examples of Data Structures.

7. Classify the types of arrays based on dimensions.

8. Classify the types of graphs based on their edge representations.

9. Explain how Radix Sort processes the elements of an array.

10. Describe the primary advantage of Fibonacci Search over Binary Search.

SECTION – B (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.(K3)

11. a) Differentiate between linear and nonlinear data structures. Give an example of each.

(OR)

b) Evaluate the impact of using polynomial algorithms in real-world applications compared to exponential algorithms. Provide an example where a polynomial algorithm is preferred.

12. a) Construct a linked list from the following array: 10,20,30,40,50. Write a function to display the elements of the linked list.

(OR)

b) Construct a doubly linked list with the following elements: 10, 20, 30, 40, and 50. Then, display the elements in both forward and backward order.

13. a) Construct a binary tree using the following values in the order given: 15, 10, 20, 8, 12, 17, 25. What is the inorder traversal of the constructed tree?

(OR)

b) Identify and explain the significance of cycles in a graph. Provide an example of a graph with a cycle and one without a cycle.

14. a) Apply the Insertion Sort algorithm to sort the array [9, 5, 1, 3, 7]. Show the intermediate steps.

(OR)

b) Demonstrate how the Quick Sort algorithm would sort the following array: [8, 3, 1, 7, 0, 10, 14]. Show each step of the partitioning process.

15. a) Apply linear search to the following unsorted list of names: ["Alice", "Eve", "Bob", "Charlie", "David"]. Find the position of "David" in the list.

(OR)

b) Apply the binary search algorithm to find the position of the number 37 in the sorted array: [12, 18, 25, 30, 37, 42, 56, 73, 81].

SECTION – C (5 X 8 = 40 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.(K4 (Or) K5)

16. a) Analyze the time complexities of binary search and linear search algorithms. What are their best and worst-case scenarios, and how do they compare in terms of efficiency?

(OR)

b) Differentiate between direct and indirect recursion using examples.

17. a) Analyze the time complexity of the following array operations: insertion, deletion, and searching. How do they differ based on the array being sorted or unsorted?

(OR)

b) Compare the advantages of a circular queue over a linear queue and explain its implementation using an array.

18. a) Analyze the time complexity of pre-order, in-order, and post-order binary tree traversals.

(OR)

b) Analyze the differences between Depth-First Search (DFS) and Breadth-First Search (BFS) in terms of their approach and use cases.

19. a) Evaluate the efficiency of Selection Sort compared to other sorting algorithms like Bubble Sort and Insertion Sort.

(OR)

b) Critically assess the pros and cons of Merge Sort compared to Quick Sort.

20. a) Examine a scenario where using Interpolation Search would be more advantageous than Binary Search.

(OR)

b) Assess a situation where Binary Search might not be the most efficient search algorithm. Suggest an alternative approach.
