



University of Engineering & Management, Kolkata

Term - I Examination, August - September, 2021

Programme Name: B.Tech in Computer Science

Semester: III

Course Name: Data Structure & Algorithms

Course Code: PCC CS301

Full Marks: 100

Time: 3 hours

GROUP A (20 Marks)

Answer following questions. Each question is of 2 marks.

1.
 - i) Why a node definition should be a self-referential structure?
 - ii) Define two disadvantages of a linked list over the array.
 - iii) Define Array of Pointer with an example.
 - iv) Given an array `int marks[]={99,67,78,56,88,90,34,85}`, calculate the address of `marks[4]` if the base address = 1000.
 - v) When do you think the worst case scenario for linear search occurs and why?
 - vi) Contrast between the best case scenarios of linear search and binary search operations.
 - vii) Explain the term asymptotic.
 - viii) Compare the concept of Big-oh & Big-omega.
 - ix) Solve "If a binary tree consists of 8 nodes, then what will be the minimum and maximum height of the tree?"
 - x) Inspect the way how you can identify left most node of a full binary tree from tree traversals (In, Pre & Post).

GROUP B (30 Marks)

Answer following questions. Each question is of 5 marks.

2. Write a C function to insert a node after a specific node in a singly linked list. (Define node structure)
3. Illustrate how binary search operation works with an example.
4. Construct a binary tree for the given string `T = (A (B (E (F (I (J))), C (G (K)), D (H(L))))`.
5. A) Explain how to store and access members of a structure using a pointer to structure.
OR
B) Write down and describe an algorithm to delete an element from the middle of an array.
6. A) Write down a C program to subtract two matrices using Dynamic memory allocation.

OR

B) Define the utility of the start pointer and NULL pointer in a linked list? Explain with an example.

7. A) Write and explain the algorithm for interpolation search.

OR

B) Show that $N_0 = N_2 + 1$ (where N_0 is number of leaf nodes in a binary tree and N_2 is the number of internal nodes of degree 2).

GROUP C (50 Marks)

Answer following questions. Each question is of 10 marks.

8. Write down and describe the algorithms that add a node at the beginning and end of a singly linked list.

9. Contrast how linear search algorithm and its complexity differs in the following cases: (i) Assuming single occurrence of an element in a list, (ii) Assuming multiple occurrences of an element in a list.

10. A) Define sparse matrix. Explain triplet representation of sparse matrix with an example. Write down a C program to check whether a matrix is sparse or not.

OR

B) Design an algorithm for performing the addition of two polynomials using Array. Explain the algorithm with an example.

11. A) Compare and contrast among the different time complexities of linear search and binary search operations.

OR

B) "Interpolation Search is an improvement over Binary Search". Justify whether the statement is correct or not with examples.

12. A) Construct a binary tree with all the letters present in your full name. Your tree should not contain repeated entries or space. Then perform in-order, pre-order and post-order traversal on this tree.

OR

B) i) Analyze the time and space complexity of an algorithm to find second highest element from an array. (Do not use sorting methods) 5

ii) Take any function $f(n)$. Analyze the concept of growth function $g(n)$ for this $f(n)$. Then find c_1, c_2, n_0 , considering this $g(n)$ as theta bound. 5
