

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, MAY 2025

FIRST YEAR [BATCH 2024-28]

COMPUTER SCIENCE

Paper : 2CMSCOC1

Date : 17/05/2025

Time : 11 am – 1 pm

Full Marks : 50

Answer **any five** questions :

[5×10]

1. a) What is the advantage of storing elements in the form of Binary Search Tree?
b) Prove that a tree with 'n' nodes has exactly (n-1) edges.
c) Prove that for any non-empty binary tree, if n is the number of nodes and e is the number of edges, then $n = e + 1$.
d) Analyze the average case complexity of quick sort. [2+3+3+2]
2. a) Construct an AVL tree with the following elements 50,60,70,15,10,30,20,35,25,40,80.
b) How will you represent the polynomial $4x^5 - 10x^3 + 30x^2 - 19$ using a linked list?
c) Apply the quick sort algorithm for data set 6, 10, 12, 4, 9, 3, 7. Consider the first element as a Pivot element. Give all the steps of sorting. [4+2+4]
3. a) What is the advantage of using Circular Queue over Linear Queue?
b) Evaluate the following postfix expression using stack and show each step:
7 5 2 + * 4 1 5 - / -
[Assume that all the operands have single digit]
c) Convert the following infix expression to postfix using stack:
(a+b*c^d)*(e+f/d) [2+4+4]
4. a) Construct a binary tree using the In-order and Post-order traversal of the nodes given below:-
In-order : D B F E A G C L J H K
Post-order : D F E B G L J K H C A
b) Is it possible to represent a binary tree using an array? Justify with an example.
c) Write the algorithm for inorder tree traversal (non-recursive). [3+2+5]
5. a) What is ADT (Abstract Data Type)?
b) Define Stack and Queue using ADT.
c) Write an algorithm to insert a node in a singly linked list after a specified node. [2+(2+2)+4]
6. a) A recursive procedure has 'last-in-first-out' characteristic. How many data structures should be used to handle such cases? Justify with a simple example.
b) Apply Merge sort on the following elements 40,35,20,21,33,07,05,60. Show each step in detail. [(2+3)+5]
7. a) Explain the following notations: O, Ω and θ . Give examples of each notation.
b) Define complete Binary tree.
c) What are the best case, average case and worst case time complexity of interpolation search? [(2×3)+2+2]