

Ref. No.: Ex/IT/T/121/2019 (Old)

BACHELOR OF ENGINEERING IN INFORMATION TECHNOLOGY  
1<sup>st</sup> YEAR 2<sup>nd</sup> SEMESTER (OLD) EXAMINATION, 2019  
**Data Structures and Algorithms**

Time: 3 Hours

Full Marks: 100

**ANSWER FROM EVERY GROUP**

**All part of a group must be written in one place.**  
**Diagrams should be drawn using pencil.**

**Group 1: (CO1 = 20)**

(5 x 2) + 5 + 5 = 20

1. What do you mean by Time Complexity and Space Complexity of Algorithms? Explain with examples.
2. Deduce the time complexity of selection sort and bubble sort algorithm.

Or

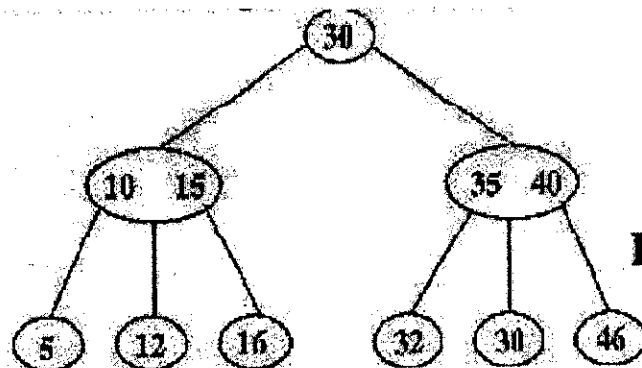
7 + (4 + 4) + 5 = 20

1. Reconstruct the binary tree whose inorder and postorder traversal are given below:
  - i. Inorder: A B D K H N L F I C J M G E
  - ii. Postorder: K N L H I F D M J G E C B AConstruct the binary tree (write each step clearly) and show the result of post order traversal.
2. Derive the postfix and prefix expression of the following infix expression:  
 $((A + B) * C - (D - E)) ^ (F - G)$
3. Write an algorithm to insert an element in a stack implemented using a linked list.

**Group 2: (CO2 = 30)**

2 + 7 + 3 + 10 + 8 = 30

1. What are the applications of B-Tree?
2. Consider the following B Tree of order 3. Show the tree after operations like Insert 43, Insert 50, Delete 15.



3. What are the problems of Binary Search Tree?  
Or  
Explain the improvement of performance by the use of Height Balanced Tree?
4. Explain how a height balanced tree can be formed by inserting the following elements in the given order:  
21, 22, 23, 24, 25, 26, 28, 29, 30, 27, 31. Show how the root element can be deleted from the above tree.
5. Show with example that changing child pointers during single and double rotation does not violate binary search tree property.

**Group 3: (CO3 = 25)**

$$(3 \times 4) + (5 + 5 + 3) = 25$$

1. Complexity analysis of any three sort
  - a. Merge Sort
  - b. Bubble Sort
  - c. Insertion Sort
  - d. Quick Sort
2. Describe the algorithm of Bubble Sort and Selection Sort and execute the same and note the difference for the following list: 23, 4, 55, 6, 66, 7, 77, 8, 88, 90

Or

$$(3 + 5 + 5)$$

- a. Insertion sort gives better result when number of elements to be sorted is less – Illustrate.
- b. Why merge sort run faster than bubble sort in most of the cases - explain?
- c. Show the complexity of merge sort algorithm is  $O(n \log_2 n)$ .

**Group 4: (CO4 = 25)**

$$5 \times 5 = 25$$

1. Write Short Note on any FIVE of the following:
  - a. Hashing
  - b. Linear Probing and Double Hashing
  - c. Collision Resolution in Hashing.
  - d. Minimum Spanning Tree of a graph
  - e. Dijkstra's Algorithm
  - f. Chaining and Open Addressing in Hashing