


Final Assessment Test – November 2025

Course: BCSE202L - Data Structures and Algorithms

Class NBR(s): 1355/1376/1394/1398/1404/1407/1411/

1414/1417/1424/1427/1430/1435/1440/1473/1488/

1513/1533/1544/1553/1566/1583/1655/2028/2857

Slot: E1+TE1

Time: Three Hours

Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

COs	CO Statements
CO1	Understand the fundamental analysis and time complexity for a given problem.
CO2	Articulate linear, non-linear data structures and legal operations permitted on them.
CO3	Identify and apply suitable algorithms for searching and sorting.
CO4	Discover various tree and graph traversals.
CO5	Explicate hashing, heaps and AVL trees and realize their applications.

BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

 Answer ALL Questions

(10 X 10 = 100 Marks)

- ~~1.a)~~ Solve the following recurrence relation using Back Substitution method CO1 BL2
- i. $T(n) = 3T(n/2) + n$
- ii. $T(n) = T(n-1) + n^2$

OR

- ~~1.b)~~ Find the time complexity of the following using Master's Theorem. CO1 BL2
- i. $T(n) = 2T(n/3) + n$.
- ii. $T(n) = 6T(n/2) + n^2$.
- iii. $T(n) = 3T(n/3) + n/\log n$.

- ~~2.~~ Suppose a stack initially contains the elements A, B and C, with A as the top element and C as the bottom element. With neat diagrams, describe the contents of the stack after each the following operations: pop(), push(X), push(B), pop(), pop(), pop(). Write the necessary pseudocode for those operations. CO2 BL3

- ~~3.~~ Design an algorithm for Employee Database using LIST and perform Insert and delete operation for a particular Employee ID number. CO2 BL4

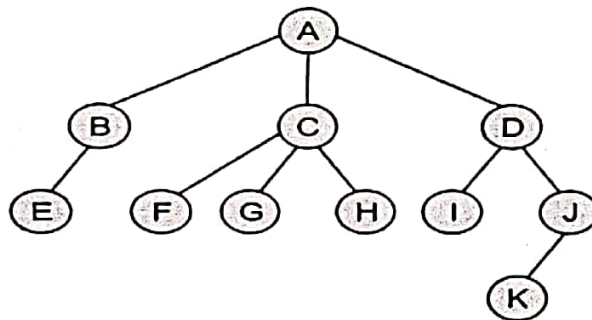
4.a) Arrange the following in an ascending order using a sorting algorithm that sorts an array by repeatedly selecting the smallest (or largest) element from the unsorted portion. Trace the output after each iteration and write an algorithm for the same. Also, analyse the worst case and best case of the algorithm.

{India, Pakistan, Australia, England, South Africa, Sri Lanka, Bangladesh, New Zealand}.

OR

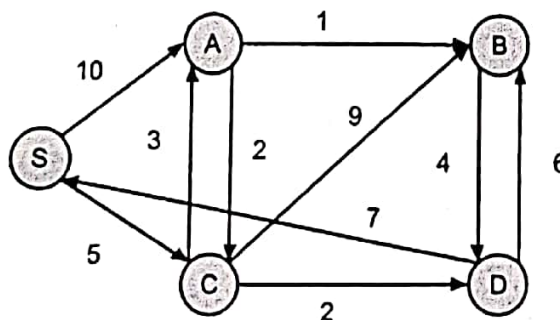
4.b) Assume that a faculty has given the following assignment to the students. Student has to get any one of his/her favourite actor/actress as input, and he/she has to display all the letters present in the actor's/actress's name in ascending order by a sorting algorithm that picks an element as a pivot and partitions the given array around the picked pivot. Write a pseudo code for the above scenario. Also find the time complexity of the sorting.

5. a) Construct a unique Binary Tree from the given In-order traversal: (4, 2, 5, 1, 6, 3) and Post-order traversal: (4, 5, 2, 6, 3, 1). [5] CO4 BL1
- b) Convert the general tree to binary tree for the following and write the algorithm for the same. [5]



6. Write an algorithm to insert the following elements {19, 3, 90, 4, 12, 85, 2, 87, 11, 6} into a Binary Search Tree (BST) in the given order. After constructing the BST, find the K-th smallest element in the BST. Assume that K value is 3. CO4 BL1

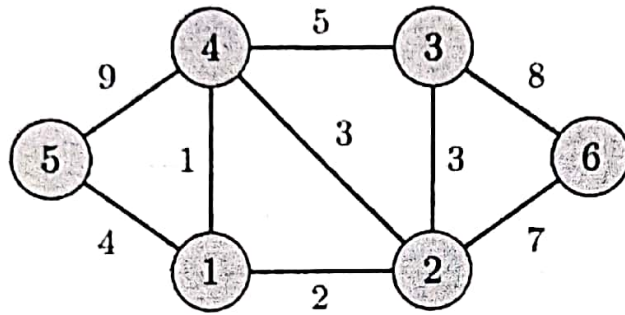
7. State the Dijkstra's algorithm for finding the shortest path from one node to other nodes of a graph and show the steps for computing the shortest path from the source vertex (S) to all other vertices in the given below graph and write a pseudo code. CO4 BL2



8.

Explain in detail about kruskal's and Prim's algorithm. For the following graph, find MST cost using kruskal's and prim's algorithm.

CO4 BL3



9.

Design a hash table of size 11 that uses the hash function $h(k) = k \text{ mod } 11$. Insert the keys {22, 41, 53, 46, 30, 13} using separate chaining and linear probing. Show the final table.

CO5 BL3

10.

Construct an AVL tree by inserting the following keys in order: {30, 20, 40, 10, 25, 50, 5}. Show the rotations performed. Discuss the time complexity of insertion, and deletion operations in AVL trees. Why are they efficient?

CO5 BL4

⇔⇔⇔ BG/K/TY ⇔⇔⇔