

# Final Assessment Test – November 2024



# VIT

Vellore Institute of Technology  
(Approved by University Grants Commission, UGC Act 1956)

Course: BCSE202L - Data structures and Algorithms

Class NBR(s): 1784/1788/1794/1798/1804/1809/1814

/1817/1821/1825/1829/1833/1837/1842/1845/1848/

4222/8003

Slot: B1+TB1

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

Answer ALL Questions

(10 X 10 = 100 Marks)

1. Find the time complexity for the following using Master's Theorem.

- i.  $T(n) = 2T(n/4) + n^{0.51}$
- ii.  $T(n) = 2T(n/2) + \log n$
- iii.  $T(n) = 5T(n/2) + \log^2 n$
- iv.  $T(n) = 3T(n/3) + n/2$

2. Consider the XYX TECHNOLOGIES Pvt Ltd is a private software company, Jack is an employee of that company, his project manager assigned a job to create an employee database of that company to store 5 records; the database should contain the fields like Employee name, Employee ID, Employee phone no., Employee age and Employee gender. Each record should keep reference of previous record information and next record information in the database. Write a program for the above scenario and perform the following operations:

- i. Inserting the data at the beginning
- ii. Inserting the data at last
- iii. Inserting the data in between the records.

3. Write the procedure for enqueue and dequeue operations of a queue of structure records given below.

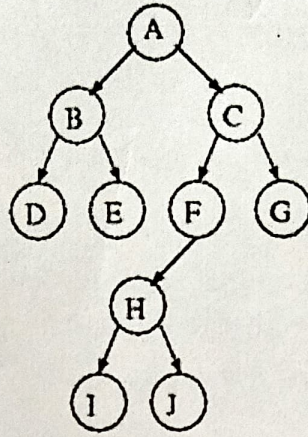
```
struct student
{
    char name[20];
    int age;
    char gender;
}s[5];
```

4. Write a program to get the CGPA of students of a class in random order and find the  $n^{\text{th}}$  greatest CGPA by using selection sort.

5. The Data structures and algorithm handling faculty has given assignment to the students that, they have to get set of cricket players as an input (Assume that the cricket players are SACHIN, DHONI, DRAVID, RAINA, KHOLI, ROHIT, ASHWIN, MALINGA, ASHWIN, YUVRAJ, DHAWAN, SANGAKARA, MURALIDARAN) and they have to display all the cricket players present in the array in the ascending order by using merge sort. Write a procedure for the above scenario.

6.

Write a program for the following binary tree elements in linked representation



7.

Consider you are working in a ABC software company, Your team leader assigned a small module of the tree based project, in that, the statement will be given to you (Assume that the statement is VITUNIVERSITYISGOOD), you have to eliminate all the duplicate characters present in the input and also display those characters in tree structure, and you have visit all elements of the tree in such a way that visit left sub-tree as a first, next to visit parent element and right sub-tree elements. Write a pseudo code for the above scenario.

8.

Write a program to construct a hash table of size 10 with the following set of keys:

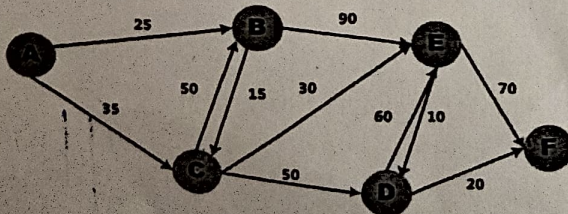
5601, 7656, 5432, 8786, 3342, 4997, 2677, 6365, 6275, 7793

Perform the following operations on the hash table:

- i. Display the hash table after inserting all the given keys based on the hash function  $h(k_i) = (2 \times k_i + 3) \% 10$ .
- ii. Avoid collision using Linear Probing.
- iii. Perform deletion using Linear Probing.

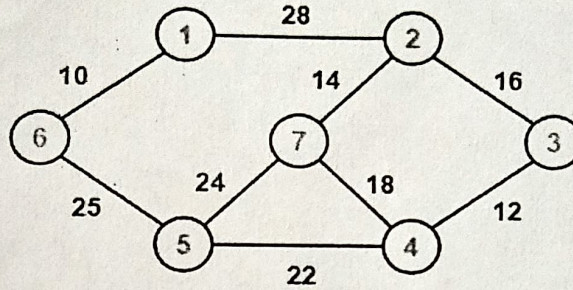
9.2)

State the Dijkstra's algorithm for finding the shortest path between nodes of a graph and show the steps while computing the shortest path from the source vertex (A) to all other vertices in the given below graph and write a pseudo code.



OR

9. b) Identify the differences between Kruskal's and Prim's in a tabular form. Construct MST using kruskal's algorithm for the following graph.



10. a) Consider Mr.X is working in the ABC technologies software company, His team leader assigned a small module of the tree based project, in that, the statement is assumed by Mr.X (The input statement should contain 8 words, each word should have minimum 3 characters and maximum 5 characters), the words present in the string should be stored in a array and Mr.X has to construct the tree in such a way that the node may have at most 2 children from the original array and while Mr.X is constructing the tree in each level, Mr.X supposed to check the parent value should be lesser than its children nodes and also display the same. After constructing the tree, do the sorting based on the first character present in the tree. Write a procedure for the above scenario.

OR

10. b) Construct AVL tree for the following data  
201,206,301,19,41,14,218,118,105,10,12,3,4. Also delete 218, 105 and 4.

↔↔↔ BG/K/TX ↔↔↔