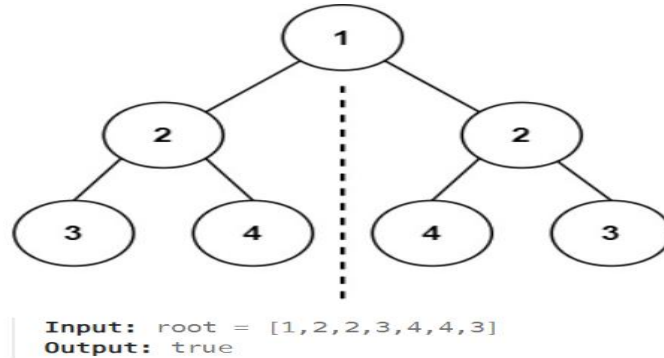## 14 MARKS

1. i) Write a Code to check whether it is a mirror of itself (i.e., symmetric around its center).

Example 1:


```
Input:  root = [1,2,2,3,4,4,3]
Output: true
```

ii) Design a function that finds all positive numbers in the array that have their opposites in it as well. Describe approaches for solving optimal worst case and optimal average case performance, respectively

2. Develop the code the given task .

   - You are given the task of choosing the optimal route to connect a master server to a network of N routers.

   - The routers are connected with the minimum required N-1 wires into a tree structure, and for each router we know the data rate at which devices (that are not routers) that are connected to it will require information.

   - That information requirement represents the load on each router if that router is not chosen to host the master. Determine which router we need to connect the master to in order to minimize congestion along individual lines

3. Write a program to print binary representation of the given an integer n, return an array ans of length n + 1 such that for each i (0 <= i <= n), ans[i] is the number of 1's in the binary representation of i. [**Leetcode**]

   Example 1:

   Input: n = 2

   Output: [0,1,1]

   Explanation:

   0 --> 0

   1 --> 1   2 --> 10

4. Write a program get a positive integer num consisting only of digits 6 and 9.Return the maximum number you can get by changing at most one digit (6 becomes 9, and 9 becomes 6).

Example 1:

Input: num = 9669

Output: 9969

Explanation:

Changing the first digit results in 6669.

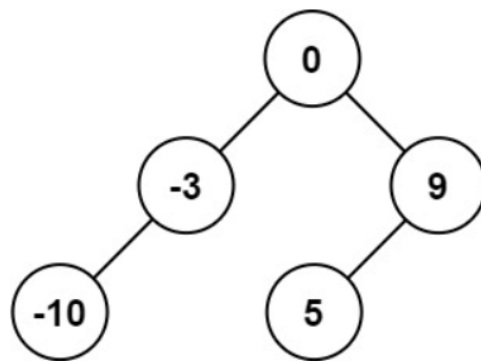Changing the second digit results in 9969.

Changing the third digit results in 9699.

Changing the fourth digit results in 9666.

The maximum number is 9969.

5. Given an integer array nums where the elements are sorted in ascending order, convert it to a height-balanced binary search tree using Divide and Conquer
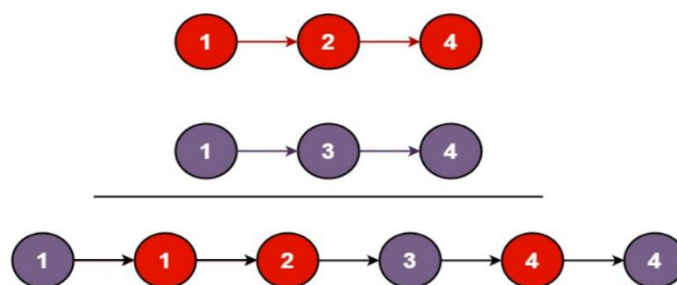
Example 1:


```
Input: nums = [−10,−3,0,5,9]
Output: [0,−3,9,−10,null,5]
Explanation: [0,−10,5,null,−3,null,9] is also accepted:
```

6. Write a code to merge two sorted linked lists list1 and list2.Combine the two lists into one sorted list. The list should be made by splicing together the nodes of the first two lists. Return the head of the merged linked list using recursion [**Leetcode**]
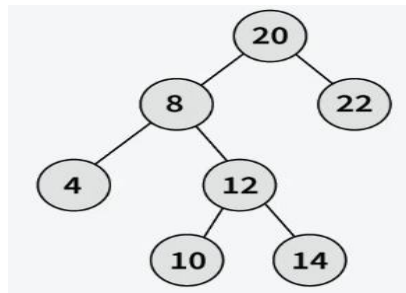
Example 1:


```
Input: list1 = [1,2,4], list2 = [1,3,4]
Output: [1,1,2,3,4,4]
```

7. i) Given a Binary Search Tree (BST) and a positive integer k, the task is to find the kth largest element in the Binary Search Tree.
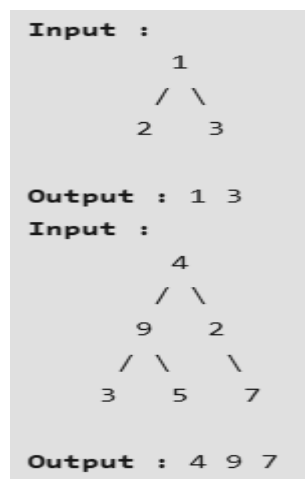
Example:

Input: k = 3

Output: 14

Explanation: If we sort the BST in decreasing order, then it will become 22, 20, 14, 12, 10, 8, 4. 14 is the 3rd largest element

ii) Given a binary tree, find the largest value in each level.

8. Implement the Dijkstra's Algorithm for the given problem StatementA delivery company needs to find the fastest route from a warehouse to multiple customer locations in a city road network. Roads have different traffic conditions, making travel times unequal. How can a graph be used to model this city network? Which algorithm will you use to find the shortest path, and how does it work? Explain its time complexity for the scenario

9. A telecom company wants to connect multiple cities with fiber optic cables at the lowest possible cost. Each city is a node, and cables between cities have different costs.

Question:

How can this problem be modeled as a graph problem?

Which greedy algorithm is best suited for finding the minimum cost network? Implement Kruskal's or Prim's Algorithm to find the Minimum Spanning Tree (MST)

10. Given a string s, return the longest palindromic substring in s.

Example 1:[Leetcode]

Input: s = "babad"

Output: "bab"

Explanation: "aba" is also a valid answer.

11. A vending machine needs to give customers the least number of coins as change. You are given denominations (e.g., ₹1, ₹2, ₹5, ₹10, ₹20, ₹50, ₹100).How can a greedy approach be used to minimize the number of coins?

Provide an example where the greedy approach fails.

Implement the Coin Change Algorithm (Greedy) and explain its time complexity.

12. Given two sorted arrays nums1 and nums2 of size m and n respectively, return the median of the two sorted arrays.

The overall run time complexity should be O(log (m+n)).

Example 1:[Leetcode]

Input: nums1 = [1,3], nums2 = [2]

Output: 2.00000

Explanation: merged array = [1,2,3] and median is 2