Question 1: Binary Search Tree (BST) Operations

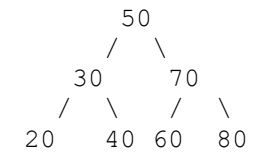
Given Keys:

[50, 30, 20, 40, 70, 60, 80]

1. Constructing the BST:

- **Insert 50:** Root node.
- **Insert 30:** Becomes the left child of 50.
- **Insert 20:** Becomes the left child of 30.
- **Insert 40:** Becomes the right child of 30.
- **Insert 70:** Becomes the right child of 50.
- **Insert 60:** Becomes the left child of 70.
- **Insert 80:** Becomes the right child of 70.

Initial BST Structure:



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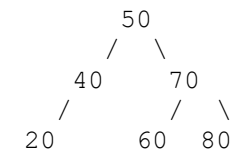
2. Deleting Key 30:

- Node 30 has two children (20 and 40).
- Replace 30 with its in-order successor (40).
- Delete the original 40 node.

BST After Deletion of 30:



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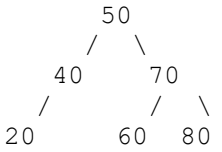
3. Searching for Key 40:

- Start at the root (50).
- Move to the left child (40).
- **Key 40 Found.**

Final BST Structure:

After performing all operations, the BST structure is:



Explanation of Operations:

1. **Insertion:** Each key is inserted based on the BST property (left < root < right).
2. **Deletion:** Replaced 30 with its in-order successor (40) to maintain BST properties.
3. **Search:** Located 40 in two steps.