**CO3: Hierarchical Tree Structures**

**Basic Level Questions:**

1. Construction of Expression Tree.
2. Implementation of Binary Search Tree.
3. Implementation of Dictionary operations using AVL Tree.
4. Implementation of Priority Queue using Heap structures.
5. Write a function to find the height of a binary tree.**(Basic)**
6. Write a function to print the level order traversal of a binary tree.**(Basic)**
7. Implementation of Tree Traversal Techniques. **(Basic)**
8. Write a function to remove the highest priority element (delete) and retrieve the highest priority element without removing(peek). **(Basic)**
9. Evaluation of Expression tree. **(Basic)**
10. Write a function to check if a given binary tree is a binary search tree.**( Basic)**
11. Write a function to find the inorder successor of a given node in a BST.**( Basic)**
12. Write a function to find the lowest common ancestor of two nodes in a binary tree. **(Basic)**
13. Implementation of Splay Tree ADT.**( (Basic)**
14. Implementation of Threaded binary tree and inorder traversal to display the elements of the tree. **(Basic)**

**Medium Level Questions:**

1. Imagine you're a manager at a company with a hierarchical organizational structure. Each employee reports to a supervisor, and supervisors can have multiple employees reporting to them. You want to determine the number of levels (layers) in the company hierarchy, from the CEO (root) down to the lowest-level employees (leaf nodes).
2. Imagine you're a firefighter battling a blaze in a high-rise apartment building. The building has multiple floors, and each floor has several apartments (nodes). To ensure everyone gets evacuated safely and efficiently, you need to visit each floor (level) and systematically check every apartment on that floor.
3. Imagine you're a librarian tasked with organizing and retrieving books from a library with a Dewey Decimal Classification system (a hierarchical structure). The library uses a tree structure to represent the categories and subcategories of books. Each node in the tree represents a category (e.g., Fiction, Science), and child nodes represent subcategories (e.g., Mystery, Astronomy). You need different approaches to efficiently manage this vast collection of books. Write routines for
4. Taking Inventory (In-order Traversal)
5. Finding a Specific Book (Pre-order Traversal)
6. Shelving New Books (Post-order Traversal)
7. Imagine you're working in an emergency room where patients arrive with varying degrees of urgency. The hospital uses a priority queue (implemented as a min-heap) to determine who gets treated first. Patients with the most critical conditions (highest priority) are at the front of the queue (represented by the root node). Write routines for
8. Treating the Most Critical Patient (Peek)
9. Discharging a Stable Patient (Pop)
10. To create a function that evaluates mathematical expressions represented in an expression tree format within the calculator application.
11. To implement a function that checks if the library's binary tree structure maintains books in chronological order based on their publication years.
12. Write a function to find the inorder successor of a given node in a BST.

**Advanced Level Questions:**

1. To implement a function that finds the inorder successor of a specified student's name in the BST structure representing the school's student database.
2. To implement the Splay Tree data structure to manage product recommendations and provide efficient operations such as insertion, deletion, and search. Additionally, ensure that the tree automatically adjusts itself through splaying to optimize access to frequently recommended products.
3. To implement a threaded binary tree for storing book categories and perform an inorder traversal to display the categories in alphabetical order.