FAST NATIONAL UNIVERSITY OF COMPUTER & EMERGING SCIENCES

PESHAWAR CAMPUS

Data Structures Lab

Lab Task : Hashing

Q1: Implement Functions of Heap Data Structure using C++

You are tasked with implementing a max heap data structure and writing functions to perform two primary operations: **deleting the root node** and **sorting the elements** using heap sort. A max heap is a binary tree where the value of each node is greater than or equal to the values of its children, and the tree is complete.

Problem Statement:

Implement a max heap in C++ that supports the following functionalities:

1. **Delete the Root Node**: Remove the maximum element (root node) from the heap and reheapify the remaining elements.
2. **Heap Sort**: Sort an array of elements using the heap data structure.

Requirements:

1. **Class Definition**:
    - Define a Heap class with attributes to store the heap elements and the size of the heap.
2. **Functions**:
    - int deleteRoot(): Remove and return the root node (maximum element) from the heap.
    - void heapSort(): Sort the elements stored in the heap in ascending order using heap sort.
3. **Implementation Details**:
    - Use an array to represent the heap. The root node should be at index 0.
    - The left and right children of a node at index i are located at indices 2 * i + 1 and 2 * i + 2, respectively.
    - Implement heapify to ensure the heap property is maintained after deletion.
    - heapSort should rearrange the elements in ascending order by repeatedly deleting the root and reheapifying the heap.