# Lab Assignment: 9 ( HEAP ) Total marks : 10

NO submission allowed after 5:10 PM

## Objective:

Implement insertion, deletion, and heapify operations in a binary max-heap using C++.

## Problem Statement:

Write a C++ program to perform the following operations on a binary max-heap:

1. Insert a series of integers into an initially empty binary max-heap.

2. Delete the maximum element from the binary max-heap.

3. Ensure the binary max-heap properties are maintained after each insertion and deletion.

## Instructions:

1. Define the structure for a binary max-heap.

2. Implement the necessary functions to insert nodes, delete the maximum node, and maintain the heap property.

3. The insertion and deletion functions should automatically maintain the heap property if any violations occur.

- Details:

Your program should define a class `MaxHeap` with the following methods:

- `insert(int value)`: Inserts a value into the binary max-heap and maintains the heap property.

- `deleteMax()`: Deletes the maximum value from the binary max-heap and maintains the heap property.

- `printHeap()`: Prints the elements of the heap in array representation.

## Example:

Consider the sequence of insertions: 10, 20, 15, 30, 40.
After insertions, delete the maximum element.

Input: `10 20 15 30 40`

Expected Output:

- Heap array after insertions: `[40, 30, 15, 10, 20]`

- Heap array after deleting max: `[30, 20, 15, 10]`

## Test Cases:

Input: Input: 10 20 15 30 40

Expected Heap array after insertions: [40, 30, 15, 10, 20]

Expected Heap array after deleting max: [30, 20, 15, 10]

Input:  5 3 8 4 1

Expected Heap array after insertions: [8, 4, 5, 3, 1]

Expected Heap array after deleting max: [5, 4, 1, 3]

Input:  50 30 20 15 10 8 16

Expected Heap array after insertions: [50, 30, 20, 15, 10, 8, 16]

Expected Heap array after deleting max: [30, 16, 20, 15, 10, 8]