Assignment – 4

1. Given an integer array, find the peak element in it. A peak element is an element that is greater than its neighbors. There might be multiple peak elements in an array, and the solution should report any peak element.

   An element $A[i]$ of an array A is a peak element if it is not smaller than its neighbor(s).

   $A[i-1] <= A[i] >= A[i+1]$for $0 < i < n-1$

   $A[i-1] <= A[i]$ if $i = n$–1

   $A[i] >= A[i+1]$ if $i = 0$

   Use divide and conquer algorithm to find a peak element in $O(\log n)$ time.

2. You are given an array of n integers. A majority element is defined as an element that appears more than $\frac{n}{2}$ times in the array. Your task is to design and implement an algorithm that finds the majority element using the Divide and Conquer technique in $O(n \log n)$ time.