**Longest Increasing subsequence**

**code:**

package Exception;

import java.util.Scanner;

public class LongestIncreasingSubsequence {

    public static void LIS(int X[]) {

        int parent[] = new int[X.length];

        // Track the predecessors/parents of elements of each subsequence.

        int increasingSub[] = new int[X.length + 1];

        // Track ends of each increasing subsequence.

        int length = 0;

        // Length of longest subsequence

        for (int i = 0; i < X.length; i++) {

            // Binary Search

            int low = 1;

            int high = length;

            while (low <= high) {

                int mid = (int) Math.ceil((low + high) / 2);

                if (X[increasingSub[mid]] < X[i]) {

                    low = mid + 1;

                } else {

                    high = mid - 1;

                }

            }

            int pos = low;

            // update parent/previous element for LIS

            parent[i] = increasingSub[pos - 1];

            // Replace or append

            increasingSub[pos] = i;

            // update the length of the longest subsequence

            if (pos > length)

                length = pos;

        }

        // Generate LIS by travering parent array

        int LIS[] = new int[length];

        int k = increasingSub[length];

        for (int j = length - 1; j >= 0; j--) {

            LIS[j] = X[k];

            k = parent[k];

        }

        for (int i = 0; i < length; i++) {

            System.out.print(" " + LIS[i]);

        }

        System.out.println();

        System.out.println("The length of subsequence is " + length);

    }

    public static void main(String args[]) {

        Scanner sc = new Scanner(System.in);

        System.out.println("enter the size of array: ");

        int n = sc.nextInt();

        int X[] = new int[n];

        System.out.println("Enter the elements of array  :");

        for (int i = 0; i < n; i++) {

            X[i] = sc.nextInt();

        }

        System.out.println("the element of array are :");

        for (int i = 0; i < n; i++) {

            System.out.print(" " + X[i]);

        }

        System.out.println();

        LIS(X);

    }

}