National Institute of Technology Calicut
Department of Computer Science and Engineering
Third Semester B. Tech.(CSE)
CS2092D Programming Laboratory

Evaluation - Assignment #3 (08.10.2020)

The Sorting Problem can be formally stated in terms of the input/output relationship as follows:

Input: A sequence of n numbers $\langle a_1, a_2, \ldots, a_n \rangle$

Output: A permutation $\langle a'_1, a'_2, \ldots, a'_n \rangle$ of the input sequence such that $a'_1 \leq a'_2 \leq \cdots \leq a'_n$.

1. Let $A[1 \ldots n]$ be an array of n distinct numbers. If $i < j$ and $A[i] > A[j]$, then the pair (i, j) is called an inversion of A.

   Write a program that uses the MERGE-SORT algorithm for sorting a given input sequence of integers present in an array A. Your program must print the number of inversions in the input array.

   Input format:

   - The first line of the input contains an integer $n \in [0, 10^5]$, the size of the array A.
   - The second line lists the n elements in A, as space-separated integers in the range $[-10^3, 10^3]$.

   Output Format:

   - The first line of the output contains the elements of A in sorted order, separated by space.
   - The second line of the output contains the number of inversions required during sorting.

   Sample Input:

   5
   1 5 6 4 20

   Sample Output:

   1 4 5 6 20
   2

   Note: There are two inversions in the above example. They are:

   - 5 and 4
   - 6 and 4