Design and Analysis of Algorithms Practice
LAB 5
Date: 21^{st} September 2024

General instructions:

1. Students have to write the pseudo code first in their notebooks and implement it after that. Students can use either C / C++.

2. The point of contact (Member 1 as submitted in Gform) from the group has to submit all the programs. You may ask the TA, if you forgot the point of contact (Member 1).

3. Submit all the programs as a single Zip file in Google Class Room (GCR).

4. Pseudo code, Demonstration and Viva will be evaluated by the TA for 10 marks each and a total of 30. Pseudo code and Viva will be evaluated in the lab itself.

5. If the students wish to submit the programs later, then they can do it with in 2 days (i.e., if the lab is on Tuesday, then programs need to be submitted by Thursday 11:59 PM by point of contact (Member 1).). This evaluation will be considered for Demonstration 10 marks.

Sorting in Increasing (Non-decreasing) order

Q1) Follow the given A, B, C, D1. Calculate the exact number of comparisons and give an insight about associated time complexity in terms of Asymptotic Notations.

Q2) Follow the given A, B, C, D2. Calculate the exact number of comparisons and give an insight about associated time complexity in terms of Asymptotic Notations.

A) Create a random integer array of size 2^{15} (i.e., 32768).

B) Follow divide and conquer strategy (2-Way Merge Sort) until the input size is reduced to 2^{10} (i.e., 1024). Recursion bottoms out at this input size. All 32 leaves of the input reduction tree are containing exactly 2^{10} (i.e., 1024).

C) Perform Heap sort at each leaf node.

D1) In a bottom up fashion combine the already sorted 32 leaves using Merge Sort MERGE routine.

D2) Maintain 32 arrays (i.e., each one for a leave) which are already sorted, Find MAX out of 32 arrays and output MAX. If MAX is in A_i, then remove that element from A_i and reduce the size of it by one. Continue this process until all the elements are sorted.