PSG COLLEGE OF TECHNOLOGY

DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCES

18XW36 – DESIGN AND ANALYSIS OF ALGORITHMS LAB

FINAL LAB EXAMINATION

Date: 12.11.2020

INSTRUCTIONS

1. Duration of the examination is **45 minutes**.
2. Five minutes will be provided to upload their program. Students have to upload the code in the **google drive18XW36_DAAFinal Lab Examination** as a text file. The name of the text file should be their roll number. For example 19pw01.txt
3. Programs uploaded after the specified time will not be evaluated.
4. Programs of students indulging in malpractice will not be evaluated.

QUESTIONS

Roll Number: 1-9

1. Given an array A of size N, you have to perform two kinds of operations on A
   Type 1: (i, j ,X) : Add the value X to all elements in the range [i,j]
   Type 2: (i, j, X) : All elements in the range [i,j] is set to X

   The initial Array is A. Once an operation is performed on A, the resulting array is termed as B. The next operation has to be performed on Array B to obtain Array C etc. Operation 1 and 2 may be performed any number of times.

   If there exists an index L such that $A_L > B_L$ and $A_R = B_R$ for all $L > R >= 1$ then the array A is lexicographically larger than an array B .Design a divide and conquer algorithm of complexity O(n log n) to find the lexicographically largest array obtained after the operations are performed.

Roll Number: 10-17

2. You are given an array A of N different numbers. From the array, you have to form a set of K numbers such that (a) the sum of digits of K numbers is minimum (b) sum of digits of the K numbers is maximum. You are required to find the sum of digits until it becomes a single digit. Example: 129=1+2+9=12 =1+2=3. Design a divide and conquer algorithm of complexity O(n log n) for the above problem.

Roll Number: 18-25

3. You are given two arrays A and B (of same size) that represent the height of boys and girls respectively. You need to determine the ideal pairs among them. Ideal pairs are those elements for which A_i **%** $B_i == 0$ or B_i **%** $A_i == 0$ such that $A_i >= A_j$ and $B_i >= B_j$ and $i < j$. Design an algorithm of complexity O(n log n) to find the ideal pairs.

Roll Number: 26-33

4. You are given an array A of size N (N is even) from which you need to find the number of lucky elements. An element is lucky if and only if
    - Each element from first half of the array can be paired to each element from second half of the array.
      AND
    - In each pair, an element from the first half (Ai) is strictly greater than an element from the second half (Aj) such that A_i **%** A_j == 0 or A_j **%** A_i == 0 , i<j

   Design a O(n log n) algorithm to find the number of such lucky elements

Roll Number: 34-41

5. Given an array A of N positive integers, design an algorithm of complexity O(log n), to find the number of sub arrays in A with sum greater than M**.**