**UNIVERSITY OF CENTRAL PUNJAB, LAHORE**

**Lab Final Term Spring 2022 (X2 July 5th)**

**Lab Title:** Programming Fundamentals - Lab                           **Time:** 90 minutes

**Semester:** Spring 2022                                                          **Program Name:** BS(CS)

**Total marks: 40 marks                                                    Obtained Marks:**

**INSTRUCTIONS**

* There are total 2 questions (20+20=40 marks).
* Given example is one of the sample inputs/outputs, your program should work on different inputs as well.
* Complete your exam in given time.
* Submit one zip folder on portal having only .cpp files
* Plagiarism will never be tolerated in any case.

**Question 1: 20 Marks**

Write a program which will ask from user to enter a number N1. Create an Array1 of N1 size and fill each index of Array1 by taking the input from user. Repeat the same process to create and fill the Array2.

Now, Traverse Array1 and Array2 and populate only the even numbers into a third array.

Note:

* Memory should not be wasted
* You are allowed to traverse the Array1 and Array2 only once.

**Note: If there’s no even number in the user input, nothing would be added in the array.**

**Test Case**

|  |
| --- |
| Please enter size of first Array1 ==> 3  Please enter 3 numbers for Array1: 2 6 5  Please enter size of second Array2 ==> 5  Please enter 5 numbers for Array2: 16 5 6 1 9  Size of resultant Array is ==> 4  Elements in resultant array are: 2 6 16 6 |

**Question 2: 20 Marks**

A sparse matrix is a matrix whose most of the cells are empty and a very few number of cells have data in them. Following are Examples of integer and character sparse matrices of order 4x4. Integer matrix has 0s in empty cells and character matrix has spaces in the empty cells.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| |  |  |  |  | | --- | --- | --- | --- | | 0 | 8 | 2 | 0 | | 0 | 0 | 3 | 0 | | 0 | 7 | 0 | 0 | | 6 | 9 | 5 | 0 | | |  |  |  |  | | --- | --- | --- | --- | | A |  |  | j | | M |  |  |  | |  | P | z | f | |  |  | T |  | |

A smart way to store a sparse matrix is to only store the information of the populated cells. Each populated cell is represented as a set of index-number and the value (first is row no, second is column no, and third is value) as represented below:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| |  |  |  |  | | --- | --- | --- | --- | | 0 | 8 | 2 | 0 | | 0 | 0 | 3 | 0 | | 0 | 7 | 0 | 0 | | 6 | 9 | 5 | 0 | | |  |  |  | | --- | --- | --- | | 0,1,8 | 0,2,2 |  | | 1,2,3 |  |  | | 2,1,7 |  |  | | 3,0,6 | 3,1,9 | 3,2,5 | |

In this question, you are given a txt file named ‘MatrixData.txt’ that contains information about a character sparse matrix of order 5x5. you have to write a function that receives a 2-D character array of 5x5 and populate it using the MatrixData.txt file.

**Example 1:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| |  | | --- | | MatrixData.txt | | 0,2,G 0,4,T  1,1,M 1,3,K  2,0,R 2,2,P 2,3,z  3,1,g 3,3,T  4,0,U 4,4,d | | |  |  |  |  |  | | --- | --- | --- | --- | --- | | Output Matrix: | | | | | |  |  | G |  | T | |  | M |  | K |  | | R |  | P | z |  | |  | g |  | T |  | | U |  |  |  | K | |

**Example 2:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| |  | | --- | | MatrixData.txt | | 0,1,A  1,0,j 1,1,M  2,2,P 2,3,z  3,0,f 3,3,T 3,4,g  4,1,U 4,4,d | | |  |  |  |  |  | | --- | --- | --- | --- | --- | | Output Matrix: | | | | | |  | A |  |  |  | | j | M |  |  |  | |  |  | P | z |  | | f |  |  | T | g | | U |  |  |  | d | |