**Data Structures Lab (CSC204)** **Session: Monsoon 2023-24**
**III B.Tech (CSE)** **Date: 14.08.2022**

# Assignment-2 (Array and Basic Linked List)

1. Rakesh likes to jog every morning in a park. The park is divided into a grid of size $(N \times M)$, i.e. $N$ rows and $M$ columns. He goes to a park every day and runs across the park in a spiral manner. Write a program to find the $k^{th}$ element obtained while traversing the matrix spirally. You need to complete the method to find $k$ which takes four arguments: the first argument is the matrix $A$, the next two arguments will be $N$ and $M$ denoting the size of the matrix $A$, and then the fourth argument is an integer $k$. The function will return the $k^{th}$ element obtained while traversing the matrix spirally. Consider that he always starts from the top- left corner of the park, i.e., at $(0, 0)$ location.

   **Input:**
   $N = 4, M = 4, k = 10$
   $A[\,][\,] = \{\{1,2,3,4\},\{5,6,7,8\},\{9,10,11,12\},\{13,14,15,16\}\}$

   **Output:**
   13

2. Consider a sparse matrix as an ADT which is a collection of triplets (*row*, *column*, *value*) as shown in the Sample Input. Write a program to implement *multiplication* operation on them and print the corresponding output.

   **Sample Input:**

   $Matrix1:$

   | $Row$ | $Column$ | $Value$ |
   |---|---|---|
   | 4 | 4 | 5 |
   | 1 | 2 | 10 |
   | 1 | 4 | 12 |
   | 3 | 3 | 5 |
   | 4 | 1 | 15 |
   | 4 | 2 | 12 |

   $Matrix2:$

   | $Row$ | $Column$ | $Value$ |
   |---|---|---|
   | 4 | 4 | 5 |
   | 1 | 3 | 8 |
   | 2 | 4 | 23 |
   | 3 | 3 | 9 |
   | 4 | 1 | 20 |
   | 4 | 2 | 25 |

   **Sample Output:**

   $Result\ Of\ Multiplication:$

   | $Row$ | $Column$ | $Value$ |
   |---|---|---|
   | 4 | 4 | 6 |
   | 1 | 1 | 240 |
   | 1 | 2 | 300 |
   | 1 | 4 | 230 |
   | 3 | 3 | 45 |
   | 4 | 3 | 120 |
   | 4 | 4 | 276 |

3. You are given some integers in any order with the presence of duplicity. Write a program to perform the following tasks:

   (a) Write a function ***Create_list*** to create a singly linked list using all the given integers. This function takes the head of the linked list as an argument.

   **Sample Input:**
   64 32 97 420

   (b) Write a function ***Display_list*** to print all the elements of the list. This function takes the head of the linked list as an argument.

   **Sample Output:**
   $64 \rightarrow 32 \rightarrow 97 \rightarrow 420 \rightarrow END$

   (c) Write a function ***Inset_middle*** to insert a node after a specific node in the above created linked list and call the display function ***Display_list*** to print the updated linked list.

   **Sample Input:**
   $Data\ value\ of\ a\ node\ after\ which\ insertion\ will\ be\ performed$: 97
   $Data\ value\ of\ a\ newly\ inserted\ node$: 12

   **Sample Output:**
   $64 \rightarrow 32 \rightarrow 97 \rightarrow 12 \rightarrow 420 \rightarrow END$

   (d) Write a function ***Sum_product_dist_val*** to print the sum of the node values stored in a linked list created above. Consider a node value only if it can be expressed as a product of three distinct integers where each integer factor is $\geq 2$.

   **Sample Output:**
   484