**National University of Computer and Emerging Sciences**



**Lab Manual 03**

**Object Oriented Programming**

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## **Objectives**

After performing this lab, students shall be able to understand:

* Dynamic 2D arrays, allocation and deallocation.
* Memory Leak and Dangling Pointers

**TASK-1:**

1. Write a function **int\*\* AllocateMemory(int& rows, int& cols)** that takes size of matrix (rows and columns) from user, allocates memory for the matrix and return its pointer.
2. Write a function **void InputMatrix(int\*\* matrix, const int rows, const int cols)** which takes input the values in matrix from user(console).
3. Write a function **void DisplayMatrix(int\*\* matrix, const int& rows, const int& cols)** that displays the matrix in proper format.
4. Write a function called **maxCol** that takes as parameters a pointer to a 2D array and its dimensions. It should return the largest element in each column of the array. Since there is more than one column in 2D array, you have to return a dunamic array that contains largest of each column.

For example, if the **Sample Matrix** is

1 4 8

9 1 6

5 7 2

Your function will return array containing maximum elements of all the columns i.e.

**9, 7, 8**

1. Write a function **void DeallocateMemory(int\*\* matrix, const int& rows)** that deallocates all the memory.
2. **(Concatinate tables )** It takes two 2D arrays and returns a new 2D array that is concatenated on y or x axis.

**int \*\* concat\_table (int \*\*table1, int \*\*table2, int row1, int col1, int row2, int col2, bool axis); //**axis 0 mean x axis 1 means Y axis.

|  |  |
| --- | --- |
| **Array 1**  1,2,3  4,4,5  3,4,6 | **Array 2**  5,8,9  4,9,4  4,6,0 |
| If axis = 0 **(x-axis)** | If axis = 1 **(y-axis)** |
| **Output**  1,2,3,5,8,9  4,4,5,4,9,4  3,4,6,4,6,0 | **Output**  1,2,3  4,4,5  3,4,6  5,8,9  4,9,4  4,6,0 |

Example:

void main(){

**int rows, cols;**

**//take input from user for rows and cols**

**int \*\* matrix =** **AllocateMemory(rows,cols);**

**DisplayMatrix(matrix, rows, cols);**

**InputMatrix(matrix, rows, cols);**

**int \* maxColValues = maxCol(matrix,rows, cols);**

**for(int i=0; i<cols; i++)**

**cout<< \*(maxColValues + i) <<”,”;**

**cout<<endl;**

**int row1, col1;**

**//take input from user for rows and cols**

**int \*\* table1=** **AllocateMemory(row1,col1);**

**InputMatrix(table1, row1, col1);**

**int row2, col2;**

**//take input from user for rows and cols**

**int \*\* table2=** **AllocateMemory(row2,col2);**

**InputMatrix(table2, row2, col2);**

**bool axis;**

**cin>>axis;**

**/ / before calling concat\_table check some conditions of rows and cols**

**int \*\* result = concat\_table (table1, table2, row1, col1, row2, col2, axis);**

**/ /display result**

**//deallocation**

}

**TASK-2:**

Implement a C++ Function void myTokenizer(char \*data, char \*\*list\_tokens, char delimiter)

Your function should store the tokens in the list\_tokens 2D array and split the data array on the basis of delimiter. Delimiter is another name for ‘separator’. Call the function in main and print the list\_tokens.

Start traversing the data array until you find delimiter. Once you find the delimiter store the first token in the first row of list\_tokens. Now find second token and store in the second row of list\_tokens and so on…

First find the number of tokens that can be formed from data. This will be the number of **rows** for **char \*\*list\_tokens**. Each row will have different number of columns. e.g. If string is **my,name** and delimiter is ‘,’ then following shall be the result.

**0 1 2 3 4**

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | m | y | ‘\0’ |
| **1** | n | a | m | e | ‘\0’ |

**Don’t allocate extra memory**. Release memory before exiting program.

**Example:**

**Input**: my,name,is,Mr,Faheem

**Delimiter**: ,

**Tokens are**:

my

name

is

Mr

Faheem