

National University of Computer and Emerging Sciences

COAL Lab Midterm

Computer Organization and Assembly Language _

1000000			
Time Allowed	90 Minutes	Student Name • Roll Number	
Maximum Marks	100		
		Date	26"
Lab Instructors			

Before you start make sure:

- 1. Fill word Format on GCR & submit PDF [Only PDF formats accepted]
- 2. PLAGIARISM WILL BE MARKED ZERO WITH NO RETAKE

Activity 1:

[20 Marks]

Initialize a memory array with last 4 digits of Your Own Roll Number (for example, if your roll number is 16L-4195 then memory array should be initialized with {4,1,9,5}). Then write a subroutine **LoadMN** which stores the matrices M and N using the values as described in the Code section below:

Activity 2:

[50 Marks]

Use the subroutine from Activity 1, to initialize matrices M and N.

Theory:

If M and N are two matrices of order 2×2 as shown below

$$M = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$
$$N = \begin{bmatrix} d & c \\ b & a \end{bmatrix}$$

Convolution of two matrices can be calculated by padding first matrix and scrolling the second matrix on it across the rows and columns of A and performing dot product:

ws and columns of A and performing dot product.
$$O = MN = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & a & b & 0 \\ 0 & c & d & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \oplus \begin{bmatrix} d & c \\ b & a \end{bmatrix} = \begin{bmatrix} a^2 & 2ab & b^2 \\ 2ac & 2(ad + bc) & 2bd \\ c^2 & 2cd & d^2 \end{bmatrix}$$

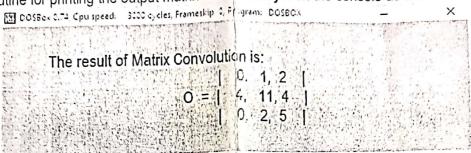
As shown above, convolution of M and N is the matrix O.

Write a subroutine, MatConv, which performs 2x2 matrix convolution using the values of M and N initialized in the Activity 1.

Activity 3:

[30 Marks]

Make a subroutine for printing the output matrix from Activity 2 on the console as shown below



Code:

Your final program structure should look like:

```
[org 0x100]
                       Change to last 4 d gits of your roll number
roll: db 4,1,9,5
                       store roll:
a: db 0
                       store roll+1
b: db 0
                       store roll+2
c: db 0
                       store roll+3
d: db 0
; rows of M matrix of order 4X4
Mr1: db 0, 0, 0, 0
                            store 0, a, b, 0
Mr2: db 0, 0, 0, 0
                        store 0, c, d,
Mr3: db 0, 0, 0, 0
Mr4: db 0, 0, 0, 0, 0
; rows of N matrix of order 2X2
                      store d, c
Nr1: db 0, 0
                     store b, a
Nr2: db 0, 0
; rows of O matrix of order 3X3
Or1: dw 0, 0, 0
Or2: dw 0, 0, 0
Or3: dw 0, 0, 0
LoadMN:
; Write code for LoadMN
MatConv:
; Write code for Matrix Convolution
PrintMat:
Write code for Printing Matrix
start:
; Write Calls to the subroutines & other codes here
mov.ax, 0x4c00
int 0x21
```