

Tutorial & Laboratory

Programming & Data Structure: CS11001/19001

Section - 4/D

DO NOT POWER ON THE MACHINE

Department of Computer Science and Engineering I.I.T.
Kharagpur

Spring Semester: 2013 - 2014 (13.03.2014)

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Assignment XII

Write a C program that does the following set of tasks. [Marks: 5 + 5 + 5 + 5 + 5]

Task I

Reads the order $n(\leq 20)$ of a square matrix over integers. Then it reads the matrix in row-major order in a 2-D array of type `int`. It prints the matrix properly from the 2-D array. [Marks: 5]

Task II

Prints the matrix in **column-major order**.

[Marks: 5]

Column-Major Order: An Example

$$\begin{bmatrix} 1_1 & 2_4 & 3_7 \\ 4_2 & 5_5 & 6_8 \\ 7_3 & 8_6 & 9_9 \end{bmatrix}$$

Column-Major Order: 1 4 7 2 5 8 3 6 9

Task III

Prints the matrix in **diagonal order**. [Marks: 5]

Diagonal Order: An Example

$$\begin{bmatrix} 1_4 & 2_7 & 3_9 \\ 4_2 & 5_5 & 6_8 \\ 7_1 & 8_3 & 9_6 \end{bmatrix}$$

Diagonal order: 7 4 8 1 5 9 2 6 3

Task IV

Prints the matrix in anti-diagonal order.

[Marks: 5]

Anti-Diagonal Order

$$\begin{bmatrix} 1_1 & 2_2 & 3_4 \\ 4_3 & 5_5 & 6_7 \\ 7_6 & 8_8 & 9_9 \end{bmatrix}$$

Anti-Diagonal order: 1 2 4 3 5 7 6 8 9

Task V

Prints the matrix in **anti-clockwise spiral order**.
[Marks: 5]

Anticlockwise Spiral Order

$$\begin{bmatrix} 1_1 & 2_{12} & 3_{11} & 4_{10} \\ -1_2 & -2_{13} & -3_{16} & -4_9 \\ 5_3 & 6_{14} & 7_{15} & 8_8 \\ -5_4 & -6_5 & -7_6 & -8_7 \end{bmatrix}$$

Anticlockwise-Spiral order: (even order matrix)

1, -1, 5, -5, -6, -7, -8, 8, -4, 4, 3, 2, -2, 6, 7, -3

Anticlockwise-Spiral Order

$$\begin{bmatrix} 1_1 & 2_8 & 3_7 \\ 4_2 & 5_9 & 6_6 \\ 7_3 & 8_4 & 9_5 \end{bmatrix}$$

Anticlockwise-Spiral order: (odd order matrix)

1, 4, 7, 8, 9, 6, 3, 2, 5

Submission by ftp

```
$ ftp 10.5.17.186
Connected to 10.5.17.186.
220----- Welcome to Pure-FTPd ----
220-You are user number 1 of 50 allowed.
220-Local time is now 07:54. .... 21.
220-IPv6 connections .....
220 ... disconnected .. inactivity.
Name (10.5.17.186:..): pds
```

Submission by ftp

```
331 User pds OK. Password required
Password: pds04
230-User pds has group access to: pds
230 OK. Current restricted directory is /
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> cd assignment12
250 OK. Current directory is /assignment12
```

Submission by ftp

```
ftp> put D0612.c
local: D0612.c remote: D0612.c
200 PORT command successful
150 Connecting to port 47093
226-File successfully transferred
226 0.001 seconds .. 39.00 Kbytes ..
27 bytes sent in 0.00 secs (1098.6 kB/s)
ftp> bye
21-Goodbye. ....
221 Logout.
$
```


Assignment XIII

Write a C program that reads a **square matrix** of type integer (order ≤ 20) in a 2-D array of type **int**. It prints the original matrix. It calls the **recursive function**

void clockSpiral(int n, int data[][ORD]) that prints the data of the 2-D array (parameter) in **clockwise spiral order**.

You may use another function, but **no loop construct** for printing.

[Marks: 5]

Clockwise Spiral Order

$$\begin{bmatrix}
 1_1 & 2_2 & 3_3 & 4_4 \\
 -1_{12} & -2_{13} & -3_{14} & -4_5 \\
 5_{11} & 6_{16} & 7_{15} & 8_6 \\
 -5_{10} & -6_9 & -7_8 & -8_7
 \end{bmatrix}$$

Clockwise-Spiral order: (even order matrix)

1, 2, 3, 4, -4, 8, -8, -7, -6, -5, 5, -1, -2, -3, 7, 6

Clockwise-Spiral Order

$$\begin{bmatrix} 1_1 & 2_2 & 3_3 \\ 4_8 & 5_9 & 6_4 \\ 7_7 & 8_6 & 9_5 \end{bmatrix}$$

Clockwise-Spiral order: (odd order matrix)

1, 2, 3, 6, 9, 8, 7, 4, 5