Islamic University of Technology (IUT)

Organization of Islamic Cooperation (OIC)

Department of Electrical and Electronic Engineering (EEE)

EEE 4416: Simulation Lab

Lab – 06 (Part B)

Exercise - 01

Problem statement: ***Zero Padding***

Given a matrix of size (m, n), pad zeros on its outer layer. Try to pad zeroes –

- only on the upper/lower side
- both sides
- pad 'k' rows of zeroes
- try 'symmetric' and 'replicate' parameters
- pad with other values than 0

Outputs would look like the following –

```
>> padarray(a,1,1)

ans =

     1     1
     1     3
     4     2
     1     1

>> padarray(a,2,1)

ans =

     1     1
     1     1
     1     3
     4     2
     1     1
     1     1

>> padarray(a,2,10)

ans =

    10    10
    10    10
     1     3
     4     2
    10    10
    10    10
```

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Command Window

```
>> a=magic(2)

a =

     1     3
     4     2

>> padarray(a,1,'pre')

ans =

     0     0
     1     3
     4     2

>> padarray(a,[1,1],'pre')

ans =

     0     0     0
     0     1     3
     0     4     2

>> padarray(a,[1,1],'both')

ans =

     0     0     0     0
     0     1     3     0
     0     4     2     0
     0     0     0     0
```

Command Window

```
>> padarray(a,[1,1],'both','r')

ans =

     1     1     3     3
     1     1     3     3
     4     4     2     2
     4     4     2     2

>> padarray(a,[1,1],'both','s')

ans =

     1     1     3     3
     1     1     3     3
     4     4     2     2
     4     4     2     2

>> padarray(a,[1,1],'both','c')

ans =

     2     4     2     4
     3     1     3     1
     2     4     2     4
     3     1     3     1

>> padarray(a,[1,1],'post','r')

ans =

     1     3     3
     4     2     2
     4     2     2
```

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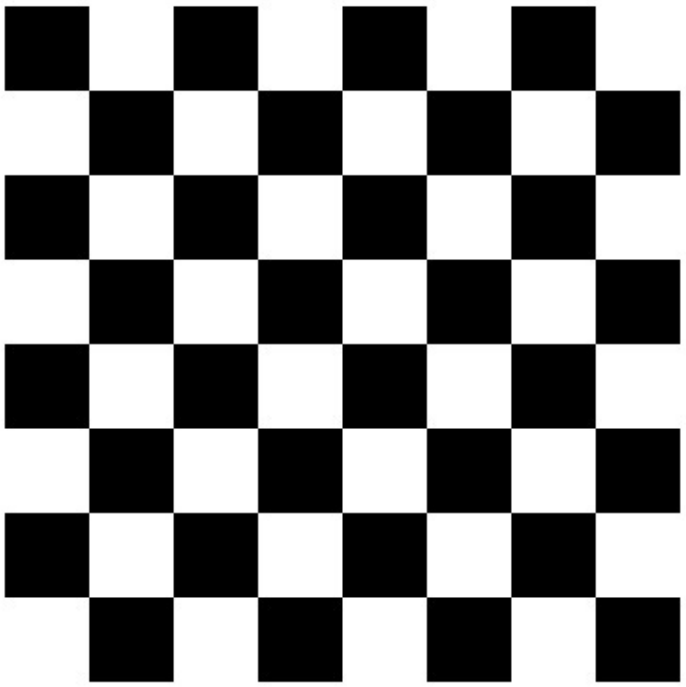
Exercise – 02

Problem statement: Checkerboard matrix

A chessboard looks like this – one white square, then one black square, and so on.



Suppose that the white square represents 1 and the black square represents 0.

Create a checkerboard matrix like this –

```
             [0 1 0 1 0
              1 0 1 0 1
              0 1 0 1 0
              1 0 1 0 1]

The matrix should be of size n [n is an integer – function input]
```

Key Takeaway:

- *repmat, repelem, imshow*
- *Introduction to Binary Image*

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Exercise – 03

Problem Statement: *One-hot encoding*

One-hot encoding is a method for converting categorical data into a numerical format so that it can be provided to machine learning algorithms, which typically require numerical input.

Given an array x, perform one hot encoding.

```
x = [3,1,0,2]
y = [ 0 0 1 0;
      0 1 0 0;
      0 0 0 1;
      1 0 0 0]
```

Explanation: Here,

- The number of rows in y = (maximum element in x) + 1
- The number of columns in y = number of elements in x

The mapping is done in the following way:

- Since the 1st element of x is 3 – the (3+1)th element in the 1st column is 1. Others are 0.
- Again, the 2nd element of x is 1 – the (1+1)th element in the 2nd column is 1. Others are 0.

And so on.

You should write a function named "*one_hot_encoding*" that takes x as an input and returns y as output.

Test case – 02:

- x= [0,0,1,0,2]
- y= [1 1 0 1 0;
  0 0 1 0 0;
  0 0 0 0 1]

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Exercise – 04

Problem Statement:

Suppose the following table contains the information of the students of IUT.

ID	Section	CGPA	Year
732	1	3.6	3
813	2	3.4	3
709	1	3.85	2
842	3	3.2	3
987	2	3.9	2
455	4	2.9	4

Now, say, you want to sort the students based on their IDs. You're already familiar with the 'sort' function. But there is one catch.

- If you use the 'sort' function, it will sort all the columns separately – which will cause a data mismatch.
- If you sort the ID column of the data, other columns remain the same. But they should also be changed accordingly. Otherwise, there will be a mismatch in the information.

So, the question is, how to do that?

Part_02:

Next, say, I want to find the information of the 3 students who have the highest CGPA. How can we do that?

Key Takeaway:

- ✓ Sortrows
- ✓ Topkrows
- ✓ Issortedrows

Check the documentation to understand how to utilize these functions for the above task.

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