

**Islamic University of Technology (IUT)**  
Organization of Islamic Cooperation (OIC)  
Department of Electrical and Electronic Engineering (EEE)

**EEE 4416: Simulation Lab**

**Lab – 01 Assignment**

**Exercise - 01**

**Problem statement: Leap Year Matrix**

You are required to create a matrix consisting of 4 rows, where each row contains the leap years from a specific century (1601–2000). Follow the steps below to complete this task:

**1. Generate Century-wise Arrays**

Create four arrays:

- `c\_17` containing years from 1601 to 1700 (inclusive) with a step of 4 years.
- `c\_18` containing years from 1701 to 1800 (inclusive) with a step of 4 years.
- `c\_19` containing years from 1801 to 1900 (inclusive) with a step of 4 years.
- `c\_20` containing years from 1901 to 2000 (inclusive) with a step of 4 years.

**2. Handle Non-Leap Centurial Years**

Replace the years 1700, 1800, and 1900 with `NaN`, since these years are divisible by 100 but not by 400 and thus are not leap years.

**3. Create the Matrix**

Stack the four arrays vertically to form a 4-row matrix, where each row represents leap years of the corresponding century.

**Expected Output**

```
[ 1604, 1608, ... ..., 1696, NaN
 1704, 1708, ... ..., 1796, NaN
 ... ..
 ... .. 2000]
```

## **Exercise - 02**

### **Problem statement:**

A retail company sells 5 different products. At the end of each week, they collect two types of data:

- i. The number of units sold for each product during the week.
- ii. The price per unit for each product.

You are required to calculate the total revenue generated during the week.

### **Data (example):**

- i. units\_sold = [120, 85, 40, 60, 100] (units sold for 5 products)
- ii. unit\_price = [10.0, 25.5, 30.0, 15.0, 8.5] (price per unit for each product)

**Output:** Total\_Revenue: 5147.5

## **Exercise - 03**

### **Problem statement:**

Write a program that takes A, an n-by-m matrix, as an input where both n and m are odd numbers and k, a positive odd integer that is smaller than both m and n (the program does not have to check the input). The program returns the input matrix with its center k-by k matrix zeroed out.

### **Input:**

```
n = 7;  
m = 7;  
A = reshape( 1:m*n, n, m )  
k = 3;
```

### **Output:**

```
A = 7×7  
[1  8 15 22 29 36 43  
 2  9 16 23 30 37 44  
 3 10  0  0  0 38 45  
 4 11  0  0  0 39 46  
 5 12  0  0  0 40 47  
 6 13 20 27 34 41 48  
 7 14 21 28 35 42 49]
```

## Exercise - 04

### Problem statement:

- i. Create a **row vector v1** containing all even numbers from 2 to 20 using the **colon operator**.
- ii. Create (**1x10**) **row vector v2** of row indices squared ( $1^2, 2^2, \dots, 10^2$ )
- iii. Generate an 8x8 matrix M, containing random integers between the **last 3 digits of your id** and 1000 and then extract the **diagonal elements** into a vector D.
- iv. Calculate the **mean value** of the vector D.

### Test case:

#### Input:

Id: 208

#### Output:

- i. Expected output v1 = [2 4 6 8 10 12 14 16 18 20]
- ii. Expected output v2 = [2 4 9 16 25 36 49 64 81 100]
- iii. M = 8x8

```
[664 722 752 594 718 701 387 925
 255 788 353 553 508 673 343 984
 394 721 500 562 851 372 388 556
 488 565 704 450 630 446 553 296
 859 641 826 611 486 581 454 412
 220 442 272 613 952 390 940 532
 242 798 945 856 902 877 549 679
 342 357 823 838 644 362 354 415]
```

D = 8x1

```
[664
 788
 500
 450
 486
 390
 549
 415]
```

- iv. Mean = 530.2500

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