B. Sc. in EEE
Summer semester

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ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Lab Quiz - 02 (**Set-A**) | Summer Semester - 2025

Course Number: EEE 4416 | Full Marks: 20

Course Title: Simulation Lab | Time: 35 minutes

Question – 01

- Create a matrix of random integers within the range 50 and size (3,6).
- Find the number of elements that are greater than 25 in that matrix.
- Create two separate 1D arrays containing even and odd numbers of that matrix.
- Sort the two arrays and remove any duplicates.
- Then join the two arrays horizontally, placing the even numbers first, then odd numbers (in sorted order).

Test Case:

- **Input:** [1, 4, 3, 5, 2, 2, 6, 7, 23, 40, 27]
- **Output:**
    - [40, 27]
    - Even = [4, 2, 2, 6, 40], odd = [1, 3, 5, 7, 23, 27]
    - Even_sorted = [2, 4, 6, 40], odd_sorted = [1, 3, 5, 7, 23, 27]
    - Out = [2, 2, 4, 6, 40, 1, 3, 5, 7, 23, 27]

Question – 02

Write a function called **'draw_E'** that takes an integer 'n' as input and returns an 'E' shaped square matrix of size n. 'n' has to be an odd number and > 4.

Test case – 01

- Input: 4
- Output: 'Input must be an odd number and greater than 4'

Test case – 02

- Input: 3
- Output: 'Input must be an odd number and greater than 4'

Test case – 03

- Input: 5
- Output:

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

Test case – 04

- Input: 7
- Output:

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

Test case – 05

- Input: 100
- Output: 'Input must be an odd number and greater than 4'

Question – 03

Write a function called '**upper_word'** that takes a string as input and returns a new string where the first letter of every word is capitalized. All other letters should be lowercase.

- Words are defined as sequences of letters separated by one or more spaces.
- Single-letter words like 'a' should remain in lowercase while 'i' should be changed to uppercase.

Test case – 01

- Input: 'Kingdom of heaven'
- Output: 'Kingdom Of Heaven'

Test case – 02

- Input: 'SOS – Save our Souls'
- Output: 'Sos – Save Our Souls'

Test case – 03

- Input: 'once upon a time'
- Output: 'Once Upon a Time'

Test case – 04

- Input: 'we were, indeed, on a break'
- Output: 'We Were, Indeed, On a Break'

Test case – 05

- Input: 'Everything they have built will fall, and from the ashes of their world, we will build a better one.'
- Output: 'Everything They Have Built Will Fall, And From The Ashes Of Their World, We Will Build a Better One.'

Question – 4

A **Pythagorean prime** is a prime number of the form $4n + 1$. They can be written as the sum of squares of two integers - $p = a^2 + b^2$. These two equations are logically equivalent. For example,

- 5 is a Pythagorean prime since –
  - 5 = 4*1 + 1
  - $5 = 1^2 + 2^2$
- 29 is a Pythagorean prime since –
  - 29 = 4*7 + 1
  - $29 = 2^2 + 5^2$
- 21 is not a Pythagorean prime since –
  - 21 = 4*5 + 1
  - 21 is not a prime number.

The first few Pythagorean primes are - 5, 13, 17, 29, 37, 41, 53, 61, 73, 89, 97, 101, 109, 113, … … .

Write a function called '**Pythagorean_prime_ab**' that takes an integer k as input, finds the k-th Pythagorean prime, and returns the integer values a and b that satisfy the condition $p = a^2 + b^2$.

Test case – 01

- Input: 1
- Output: [1, 2]
  - Here, the first Pythagorean prime is 5, which can be written as $1^2 + 2^2$.

Test case – 02

- Input: 4
- Output: [2, 5]

Test case – 03

- Input: 12
- Output: [1, 10]

Test case – 04

- Input: 625
- Output: [13, 101]