**Lab Instructions:**

* Attempt your lab within 2 hours and 30 mins. Last 30 mins are dedicated towards evaluations. No extra time will be given. Be ready for viva.
* Absent meant ZERO in the lab evaluation too.
* Code sharing is not allowed either via email or whatsapp.
* Use of laptops is not allowed. Penalty will be imposed, if found.
* You are not allowed to charge cell phones/laptops in the lab. Eatables are also prohibited.

# **Exercise (35 Marks)**

Complete all tasks given below

## **CountDigits function (3 Marks)**

Write a function to count the total number of digits in a number using a while loop. Function takes number as an input and returns count.

For example, the number is 75869, so the output should be 5.

## **Array Manipulation (7 Marks)**

Write a function named "subtotal" takes as its arguments the following:

(1) an array of values;

The function should replace the contents of each cell with the sum of the contents of all the cells in the original array from the left end to the cell in question. Thus, for example, if the array passed to the function looks like

this:

0 1 2 3 4

5.8 | 2.6 | 9.1 | 3.4 | 7.0

when the function returns, the array will have been changed so that it looks like this:

0 1 2 3 4

5.8 | 8.4 | 17.5 | 20.9 | 27.9

because 5.8 + 2.6 = 8.4 and 5.8 + 2.6 + 9.1 = 17.5 and so on. Note that the contents of cell 0 are not changed. The function should return the modified array and average of elements of the original array.

## **Counter (7.5 Marks)**

Write a function ***“Counter”*** that reads the data from the text file and calculates Total characters, digits, uppercase characters, lowercase characters and spaces then returns them all. (In this question, all characters except spaces are counted as letters). (Create own file)

**Sample Run:**

|  |
| --- |
| **Input:**  File content: Hello, I am a student of FAST University. This is my First Lab of AI. Course code is CL2001 and my roll number is 22L-2349.  **Values returned:**  No. of letters are: - -  No. of spaces are: - -  No. of uppercase letters are: - -  No. of lowercase letters: - -  No of digits : - - |

## **Calculating Timestamp (7.5 Marks)**

In data science, machine learning, and analytics, converting datetime objects to numerical timestamps is crucial for conducting time-based analyses, predictions, and modeling.

Timestamps are the number of seconds present in a date.

For example the date is : 2024-01-26 07:53:31.715391

Timestamp is : 1706255611.715391

Bonus: Can you convert timestamp to datetime format i.e vice versa.

Note: You are not allowed to use any built in functions of python. Write code from scratch.

**1.5 Finding Path (10 marks)**

A 2D List is given

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Ali is at position (1,1). Help him to find HOME (4,4). But you have to suggest the shortest path. But there is one restriction, *you are not allowed to move in diagonal*. Write a function that uses the matrix as an input and return all the possible paths. Then the main function shows the shortest of them.