Islamic University of Technology (IUT)

Organization of Islamic Cooperation (OIC)

Department of Electrical and Electronic Engineering (EEE)

EEE 4416 **Lab – 03**

Exercise - 01:

Problem statement: The following table contains the no. of students in different departments in different universities in Bangladesh.

	BUET	RUET	KUET	CUET	IUT
CSE	120	120	100	80	40
EEE	180	120	150	80	80
ME	150	80	150	80	55
CIVIL	195	80	150	80	45
CE	40	nan	30	80	nan
Architecture	100	50	80	80	nan
Management	50	50	nan	80	30

*__nan__ means 'not a number' [that department is not there].

A matrix is provided as the input. It contains numeric values (the colored portion). So, the size of the matrix is (7,5) i.e. 7 rows and 5 columns.

Find out –

I. What is the total no. of students in each university?
II. What is the total no. of students in all the 5 universities combined?
III. What is the total no. of CSE students in all 5 universities?
IV. How many students are there in the civil department of KUET?

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V. Which department/departments of each universities has the highest no. of students? [mark them by index for now i.e. index – (3,2) represents (ME, RUET)]
VI. Which department of which university has the highest #students?
VII. Try to visualize the data.

- Try out different things with the matrix by yourself.

Key Takeaway:

- Applying vectorization technique for matrix

Exercise - 02:

Problem statement: In continuation to the previous exercise solve the following problems –

Add a new varsity to the list.

SUST = [40,60,30,100,20,30,20]

- Here the given array is a row vector of size (7,1). To add it our original matrix, we need to convert it to a column vector [size = (1,7)].
- To add something to an array or matrix, you can use –
    - `a= [a , SUST ]`

Now answer the following (HW) –

I. Which department of which university has the minimum #students?
II. How many departments are there in IUT?
III. What are the indices that contains 120 students?
IV. Which varsity has the lowest #students.
V. What is the average no of students in universities in Bangladesh?
VI. Try to visualize your data and compare with your previous problem.

**so far, we've used 'numeric data type' or you can simply call them matrix. A matrix can only contain numeric values. It is called 'homogeneous data type'.

**later we'll introduce you to 'table data type'. They can contain heterogeneous data i.e., numeric data as well as string data.

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Exercise - 03:

Problem statement:

data= [120 120 100 80 40

180 120 150 80 80

150 80 150 80 55

195 80 150 80 45

40 NaN 30 80 NaN

100 50 80 80 NaN

50 50 NaN 80 30]

Now we want to modify our original data. Re-create the data for the following cases -

i. BUET (1st column) wants to add 30 students to each department.
ii. IUT (5th column) wants to double the no. of students in each department.
iii. All the universities want to decrease the no. of EEE students by 10.
iv. All the universities want to remove CE department (remove the row 5).
v. RUET wants to increase their civil department students by 30.
vi. KUET wants to increase each departments student by [5,10,5,10,10,5] respectively.
vii. Extract the data of IUT after modification.

*Take a closer look what is happening for the nan cases.

Key Takeaway:

- Broadcasting
- Matrix manipulation
- Deleting rows/columns
- Extracting rows/columns

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Exercise – 04:

Problem statement: An array or a matrix is given.

i. Create a list of all the even numbers in that matrix.
ii. Find the index (linear) of all the even numbers in that matrix.
iii. Find the subscripts of all the even numbers in that matrix.

Test Case – 01:

- input:
  a= [213 209 310 49 251 139 134 230 346 80 269 361 80 120 199 356 201 111 214 230 166 6 282 203 153]
- output: even = [310 134 230 346 80 80 120 356 214 230 166 6 282]
  index= [3 7 8 9 10 13 14 16 19 20 21 22 23]

Test case – 02:

- i/p:

  b= [26 158 365 28 57

  144 22 128 381 205

  94 151 132 64 289

  82 310 82 115 372

  326 67 307 275 293]

- o/p: even = [26 144 94 82 326 158 22 310 128 132 82 28 64 372]
  index= [1 2 3 4 5 6 7 9 12 13 14 16 18 24]

Classwork: Instead of solving for even numbers, solve for

I. odd numbers.
II. Numbers that are divisible by 3 , 11

****Key Takeaway:**

- linear index, subscripts, logical indexing, Boolean masking
- find(), ind2sub(), sub2ind(), mod()

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Exercise – 05:

Problem Statement: let's work on a string example.

Given a character array, find out –

I. how many times 'a' appeared?
II. How many characters are there?
III. Convert all the characters to lowercase.
IV. Bring out the 1st and the last element.
V. Change the 2nd element to 'x'.

Test Case – 01:

- Input: x= 'Asif Newaz'
- Output:
  I. 1
  II. 10
  III. 'asif newaz'
  IV. ['A' , 'z']
  V. 'Axif Newaz'

Test Case - 02:

- Input: x= 'Can a man still be brave if he is afraid? That is the only time a man can be brave.'
- Output:
  I. 11
  II. 83
  III. 'can a man still be brave if he is afraid? that is the only time a man can be brave.'
  IV. ['C','e']
  V. 'Cxn a man still be brave if he is afraid? That is the only time a man can be brave.'

Key Takeaway:

- Character array handling

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Exercise – 06:

Problem Statement: A character array is given. Find out its abbreviated form i.e. take the 1st element from each word and compile them together.

Test Case – 01:

- Input: x= 'convolutional neural network'
- Output: y = 'CNN'

*The output should be capital letter.

Test Case – 02:

- Input: x= 'Long Term Evolution'
- Output: y = 'LTE'

Key Takeaway:

- Split operation

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