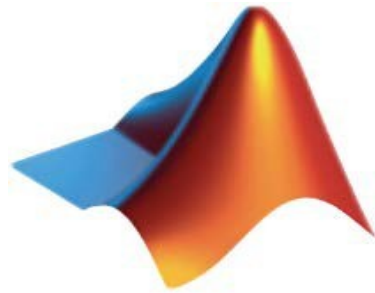


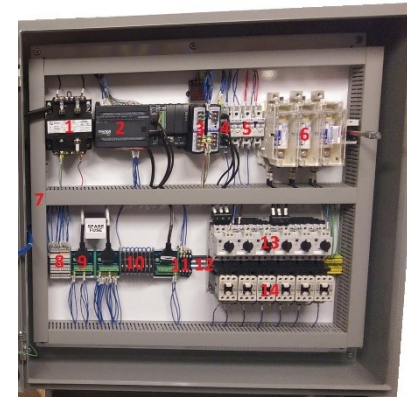


EEC380: Industrial Training (1)

Summer 2020



MATLAB



Industrial Control

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Outline

- Assignment solution
- Control Flow.
- For and While loops.
- Examples.

Assignment solution

Problem (1):

What are the functions of the following MATLAB commands?

- (a) factorial, rem, acos, save, load
- (b) eps, inf, NAN
- (c) format long, format short, format rat, format compact, format loose

Solution:

```
>>help factorial
```

```
factorial Factorial function.
```

```
factorial(N) for scalar N, is the product of all the integers from 1 to N,
```

```
>> doc format
```

rat	Ratio of small integers.	355/113
compact	Suppresses excess line feeds to show more output in a single screen. Contrast with loose.	theta = pi/2 theta = 1.5708
loose	Adds linefeeds to make output more readable. Contrast with compact.	theta = pi/2 theta = 1.5708

Assignment solution

Problem (2):

Create the following matrix A :

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 2 & 4 & 6 & 8 & 10 & 12 & 14 \\ 21 & 18 & 15 & 12 & 9 & 6 & 3 \\ 5 & 10 & 15 & 20 & 25 & 30 & 35 \end{bmatrix}$$

- Create a 3×4 matrix B from the 1st, 3rd, and 4th rows, and the 1st, 3rd, 5th, and 7th columns of the matrix A .
- Create a 15 elements-long row vector u from the elements of the third row, and the 5th and 7th columns of the matrix A .
- Create 3×3 matrix C from the 1st, 3rd, 5th columns and 1st, 2nd, 4th rows.
- Extract the maximum and minimum value from Matrix A .
- Extract the main diagonal and transpose the matrix A .

Solution:

Assignment solution

Problem (2):

Create the following matrix A :

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 2 & 4 & 6 & 8 & 10 & 12 & 14 \\ 21 & 18 & 15 & 12 & 9 & 6 & 3 \\ 5 & 10 & 15 & 20 & 25 & 30 & 35 \end{bmatrix}$$

- a) Create a 3×4 matrix B from the 1st, 3rd, and 4th rows, and the 1st, 3rd, 5th, and 7th columns of the matrix A .

Solution:

```
A =  
  
     1     2     3     4     5     6     7  
     2     4     6     8    10    12    14  
    21    18    15    12     9     6     3  
     5    10    15    20    25    30    35  
  
>> B=A([1 3 4],1:2:7)  
  
B =  
  
     1     3     5     7  
    21    15     9     3  
     5    15    25    35
```

Assignment solution

- b) Create a 15 elements-long row vector u from the elements of the third row, and the 5th and 7th columns of the matrix A .

Solution:

```
>> A
A =
     1     2     3     4     5     6     7
     2     4     6     8    10    12    14
    21    18    15    12     9     6     3
     5    10    15    20    25    30    35

>> u
u =
Columns 1 through 10
    21    18    15    12     9     6     3     5    10     9
Columns 11 through 15
    25     7    14     3    35
```

Assignment solution

c) Create 3x3 matrix C from the 1st, 3rd, 5th columns and 1st, 2nd, 4th rows.

Solution:

```
>> A
```

```
A =
```

```
     1     2     3     4     5     6     7
     2     4     6     8    10    12    14
    21    18    15    12     9     6     3
     5    10    15    20    25    30    35
```

```
>> C=A([1 2 4],1:2:5)
```

```
C =
```

```
     1     3     5
     2     6    10
     5    15    25
```

Assignment solution

- d) Extract the maximum and minimum value from Matrix A.
- e) Extract the main diagonal and transpose the matrix A

Solution:

```
>> A
```

```
A =
```

```
     1     2     3     4     5     6     7
     2     4     6     8    10    12    14
    21    18    15    12     9     6     3
     5    10    15    20    25    30    35
```

```
>> min(min(A))
```

```
ans =
```

```
     1
```

```
>> max(max(A))
```

```
ans =
```

```
    35
```


Assignment solution

- d) Extract the maximum and minimum value from Matrix A.
- e) Extract the main diagonal and transpose the matrix A

Solution:

```
>> A
A =
     1     2     3     4     5     6     7
     2     4     6     8    10    12    14
    21    18    15    12     9     6     3
     5    10    15    20    25    30    35

>> min(min(A))
ans =
     1

>> max(max(A))
ans =
    35

>> diag(A)
ans =
     1
     4
    15
    20

>> A'
ans =
     1     2    21     5
     2     4    18    10
     3     6    15    15
     4     8    12    20
     5    10     9    25
     6    12     6    30
     7    14     3    35
```

Assignment solution

Problem (3):

Create a 3×3 matrix A in which all the elements are 1, and create a 2×2 matrix B in which all the elements are 5. Then, add elements to the matrix A by appending the matrix B such that A will be:

$$A = \begin{bmatrix} 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 5 & 5 \\ 0 & 0 & 0 & 5 & 5 \end{bmatrix}$$

Solution:

```
A=ones(3);B=5*ones(2);
```

```
A(3,5)=0;
```

```
B(2,5)=0;
```

```
B=fliplr(B);
```

```
A=[A ;B]
```

```
A=ones(3);B=5*ones(2);
```

```
A(3,5)=0;
```

```
B(5,2)=0;
```

```
B=flipud(B);
```

```
A=[A ;B']
```

Assignment solution

Problem (4):

Create the matrix shown below by using the vector notation for creating vectors with constant spacing and/or the `linspace` command when entering the rows.

$$B = \begin{bmatrix} 1 & 4 & 7 & 10 & 13 & 16 & 19 & 22 & 25 \\ 72 & 66 & 60 & 54 & 48 & 42 & 36 & 30 & 24 \\ 0 & 0.125 & 0.250 & 0.375 & 0.500 & 0.625 & 0.750 & 0.875 & 1.000 \end{bmatrix}$$

Solution:

```
>> B=[1:3:25;72:-6:24;linspace(0,1,9)]
```

```
B =
```

```
     1         4         7        10        13        16        19        22        25
    72        66        60        54        48        42        36        30        24
     0     0.125     0.25     0.375     0.5     0.625     0.75     0.875     1
```

For and While loops.

for loops

The syntax of a for statement is

```
for iteration Variable = initial value: increment: final value
    commands
end
```

Example (1):

Make the user create a row vector with five elements.

```
for i=1:5
    X(i)=input('enter the vector element');
end
disp(X)
```

```
enter the vector element5
enter the vector element4
enter the vector element3
enter the vector element8
enter the vector element9
      5      4      3      8      9
```

For and While loops.

Example (2):

Make the user create a 2*2 matrix.

```
for i=1:2
    for k=1:2
        X(i,k)=input('enter the vector element: ');
    end
end
disp(X)
```

```
enter the vector element: 6
enter the vector element: -8
enter the vector element: 9
enter the vector element: 30

     6     -8
     9     30
```

For and While loops.

while loops

The syntax of a `while` loop statement is

```
while (statement)
    commands
end
```

```
x = 1
while x <= 15
    x = 2*x
end
```

Initial value of x is 1.

The next command is executed only if $x \leq 15$.

In each pass x doubles.

For and While loops.

Example (3):

Repeat Ex1 and EX2 by using While

Ex1

```
i=1;

while i<=5

Y(i)=input('enter the vector element: ');

i=i+1;

end

disp(Y)
```

Ex2

```
i=1;k=1;

while i<=2

    while k<=2

Ex1
        Y(i,k)=input('enter the vector element: ');

        k=k+1;

    end

    i=i+1;k=1;

end

disp(Y)
```

For and While loops.

Example (4):

Write a MATLAB program which will ask the user for two numbers K and L . Using the *for* loop find the sum of all numbers between K and L , that is

Solution

```
k=input('enter real number (k)');
l=input('enter another number (l)must be (l>k) ');
sum=0;
for i=k:l
    sum=sum+i;
end
disp('the sum of numbers from k : l')
disp(sum)
```


For and While loops.

Example (5):

Repeat the pervious program using the *while* loop.

Solution

```
k=input('enter real number (k)');  
l=input('enter another number (l)must be (l>k) ');  
sum=0;  
while k<=l  
    sum=sum+k;  
    k=k+1;  
end  
disp('sum of numbers from k:l =')  
disp(sum)
```

For and While loops.

Example (6):

Write a MATLAB program which will prompt the user for a predetermined word. If the word is not correct, it will ask again and will keep asking until the user enters the correct word. The program should print out the number of tries used to guess the word.

Solution

```
a='ahmed';  
b=input('enter a word','s');  
i=1;  
while strcmpi(a,b)==0 %or while strcmpi(a,b)~=1  
    b=input('enter a correct word','s');  
    i=i+1  
end  
disp('number of tries used to guess the word is')  
disp(i)
```

For and While loops.

Answer the following examples:

(1)

Use loops to create a 4×7 matrix in which the value of each element is the sum of its indices (the row number and column number of the element). For example, the value of element $A(2,5)$ is 7.

(2) A vector is given by: $x = [15 \ -6 \ 0 \ 8 \ -2 \ 5 \ 4 \ -10 \ 0.5 \ 3]$. Using conditional statements and loops write a program that determines the sum of the positive elements in the vector.

3-The following sequence is called a Fibonacci sequence **1,1,2,3,5,8,13,21,34,55** after the first two elements each element of the sequence is the sum of the pervious two elements . Write a **MATLAB** program which given the first two elements ,will generate and printout the next a elements of the a Fibonacci sequence where a is a number supplied by the user .

For and While loops.

Answer the following examples:

(4) Write a for loop that adds up the even numbers from 1 and 100. (Hint: you may find the modulus operator helpful. $\text{mod}(x,y)$ is the remainder of x/y).

(5) Write a MATLAB program which will ask the user for two numbers K and L. Using the for loop find the sum of the squares of all numbers between K and L, that is

$$\sum_{j=k}^l j^2$$

(6) Repeat the pervious program using the while loop.

(7) Write a MATLAB program which will ask the user to setup a new password. The password should be at least six characters long. If the password entered by the user is less than six characters long the program should issue a request to try again.

End of Lecture

Thank you for attention!
Any questions?

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