EXPERIMENT 3: RELATIONAL OPERATORS, LOOPS & PLOTS

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Note: (1) *Write your answers only in the **Space provided** against **each question***

(2) *Use **HELP** option of Matlab*

Run #01: Relational Operators & Logical Operators & Control Loops

Q1. Write all **Relational** and **logical** Operators used in Matlab Programming

Ans. :

```
>> A=[1 2 3;4 5 6;7 8 9];

>> B=[9 8 7;4 5 6;3 2 1];
```

Relational Operators:

- ==

```
A==B
  0  0  0
  1  1  1
  0  0  0
```

- <

```
A<B
  1  1  1
  0  0  0
  0  0  0
```

- <=

A<=B
1 1 1
1 1 1
0 0 0

- >

A>B
0 0 0
0 0 0
1 1 1

- >=

A>=B
0 0 0
1 1 1
1 1 1

- ~=

A~=B
1 1 1
0 0 0
1 1 1

Logical Operators:

- &

A&B
1 1 1
1 1 1
1 1 1

- |

A|B
1 1 1
1 1 1
1 1 1

- ~

~A
0 0 0
0 0 0
0 0 0

Q2. Check which of the following ***Variables*** are valid or invalid ? What are the reasons?

(a) log2 (b) under_dog (c) underdog (d) 5dog (e) log xyz

(f) abc-def (g) kota@55 (h) KINGmaker (i) Myclass21:42

Ans. :

Valid: log2, under_dog, underdog, KINGmaker

Invalid: 5dog, log xyz, abc-def, kota@55, Myclass21:42

Q3. Write a matlab program to calculate the sum of the first 'n' terms of the series given below using for loop.

(Note : In the program, the **input** value 'n' should be taken from the user and **disp**lay the output with the text message 'Total sum= ')

$$\sum_{k=1}^{n} \frac{(-1)^k k}{2^k}$$

Example : variable controlled loop	***Example : Relational controlled loop***

`for variable = initial:inc:final`
`statements`
end
 	
% inc = increment
	`while relation`
	`statements`
	end

Example : An **if-elseif-else** structure in MATLAB

```
if expression1                % is true
% execute these commands
elseif expression2            % is true
% execute these commands
else                          % the default
% execute these commands
End
```

Ans. :

```
clc;
clear all;
close all;
sum=0;
n=input('Value of n =');
for k=1:n;
    sum=sum+(((power(-1,k))*k)/power(2,k));
end;
disp('Total Sum =');
disp(sum);
```

Q4. The following were the daily maximum temperatures (in F) for one month

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
T(F)	58	73	73	53	50	48	56	73	73	66	69	63	74	82	84
Day	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
T(F)	91	93	89	91	80	59	69	56	64	63	66	64	74	63	69

Write a Matlab program using relational & logical operators and control loops to determine the following:

The number of days the temperature was

(i) above 75 (ii) between 60 and 80 (iii) between 50 and 60

Ans. :

```
clc;
clear all;
close all;
temp=[58 73 73 53 50 48 56 73 73 66 69 63 74 82 84 91 93
89 91 80 59 69 56 64 63 66 64 74 63 69];
above75=0;
btw60_80=0;
```

```
btw50_60=0;
for k=1:numel(temp)
    if(temp(k)>75)
        above75=above75+1;
    else if(temp(k)>=60 && temp(k)<=80)
            btw60_80=btw60_80+1;
    else if(temp(k)>=50 && temp(k)<=60)
            btw50_60=btw50_60+1;
        end;
        end;
    end;
end;
disp('Number of days with temperature above 75 is =');
disp(above75);
disp('Number of days with temperature between 60 and 80
is =');
disp(btw60_80);
disp('Number of days with temperature between 50 and 60
is =');
disp(btw50_60);
```

```
Number of days with temperature above 75 is =7

Number of days with temperature between 60 and 80 is =16

Number of days with temperature between 50 and 60 is =6
```

Q5. Write a MATLAB program to generate two random matrices, A and B of order m×n and p×q. Check whether the condition required for matrix multiplication is satisfied or not using relational operators.. If satisfied perform matrix multiplication else display matrix multiplication is not possible using **disp** keyword. Write a generic program which takes the order of the matrices during run from the user (use **input** keyword).

Ans. :

```
clc;
clear all;
close all;
m=input('no of rows of A =');
n=input('no of columns of A =');
p=input('no of rows of B =');
```

```
q=input('no of columns of B =');
A=randi(10,m,n);
disp(A);
B=randi(20,p,q);
disp(B);
if n==p
    C=A*B;
    disp(C);
else
    disp('matrix multiplication is not possible');
end;
```

Run #02: PLOTS

Q6. Keywords for plotting a figure

Q12. Write comments (i.e. what is the purpose/what is its functionality) on the following keywords related to plotting a figure in MATLAB

(i) plot ( );
(ii) stem ( );
(iii) Subplot ( );
(iv) x-label ( );
(v) y-label ( );
(vi) title ( );
(vii) legend ( );
(viii) figure ( );
(ix) grid ( );
(x) axis ( );
(xi) hold on;
(xii) hold off;

Answer :(i)plot()-It creates a 2-D line plot of the data in Y versus the corresponding values in X. It plots a continuous curve

(ii)stem()-stem(Y) plots the data sequence, Y, as stems that extend from a baseline along the x-axis. The data values are indicated by circles terminating each stem.

(iii)subplot()-Create axes in tiled positions i.e., discrete plot

(iv)x-label()-labels the x-axis

(v)y-label()-labels the y-axis

(vi)title()-adds the specified title to the current axes or standalone visualization.

(vii)legend()-legend creates a legend with descriptive labels for each plotted data series. The legend automatically updates when you add or delete data series from the axes.

(viii)figure()-Create figure window

(ix)grid()-Display or hide axes grid lines

(x)axis()-Set axis limits and aspect ratios

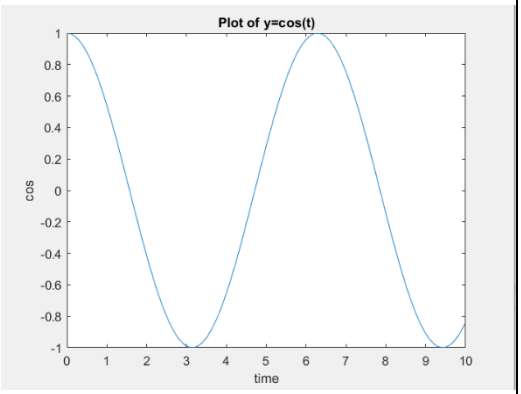
(xi)hold on-It retains plots in the current axes so that new plots added to the axes do not delete existing plots

(xii)hold off-It sets the hold state to off so that new plots added to the axes clear existing plots and reset all axes properties.

Q7. Write a matlab program using editor window to plot the function y = cos(t). Define a time vector 't' from 0 to 10 sec with an increments/steps of 0.1. Use x-label, y-label, title commands to name the x-axis, y-axis and figure title.

Answer :

```
clc;
clear all;
close all;
t=(0:0.1:10);
y=cos(t);
plot(t,y);
xlabel('time');
ylabel('cos')
title('Plot of y=cos(t)');
```



Q8. .Write a MATLAB program to define a time vector 't' from 0 to 2π with an increment/steps of $\pi/100$. Using the generated 't' values calculate the signals X1, X2 and X3 as given below

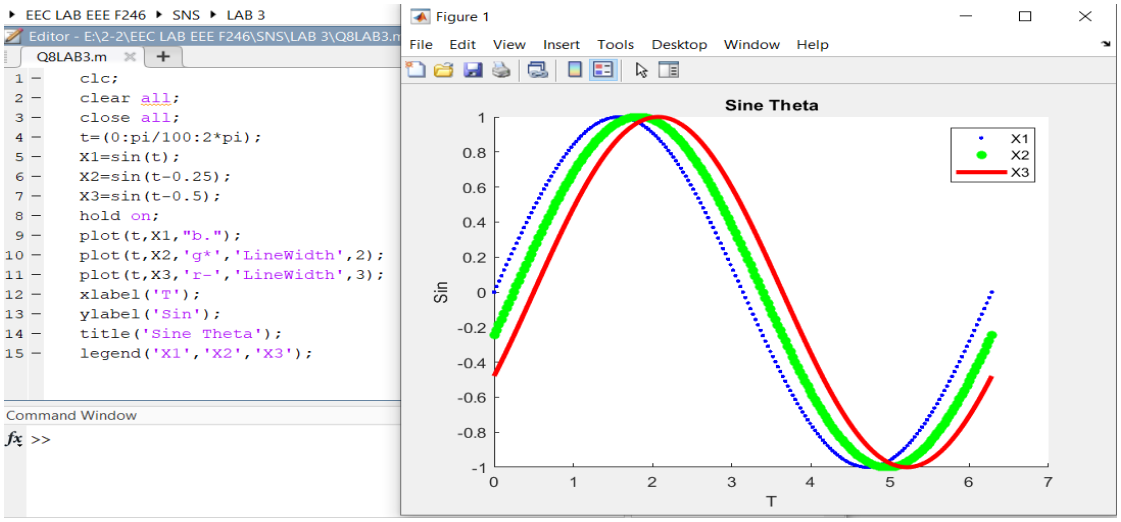
$$X_1(t) = \sin(t) \quad ; \qquad X_2(t) = \sin(t - 0.25) \quad ; \qquad X_3(t) = \sin(t - 0.5)$$

Plot $X_1(t)$, $X_2(t)$, $X_3(t)$ on same figure window (1) using hold on. Use different the plotting features like (a) linewidth (b) color and (c) different markers. (2) Without using 'hold on'

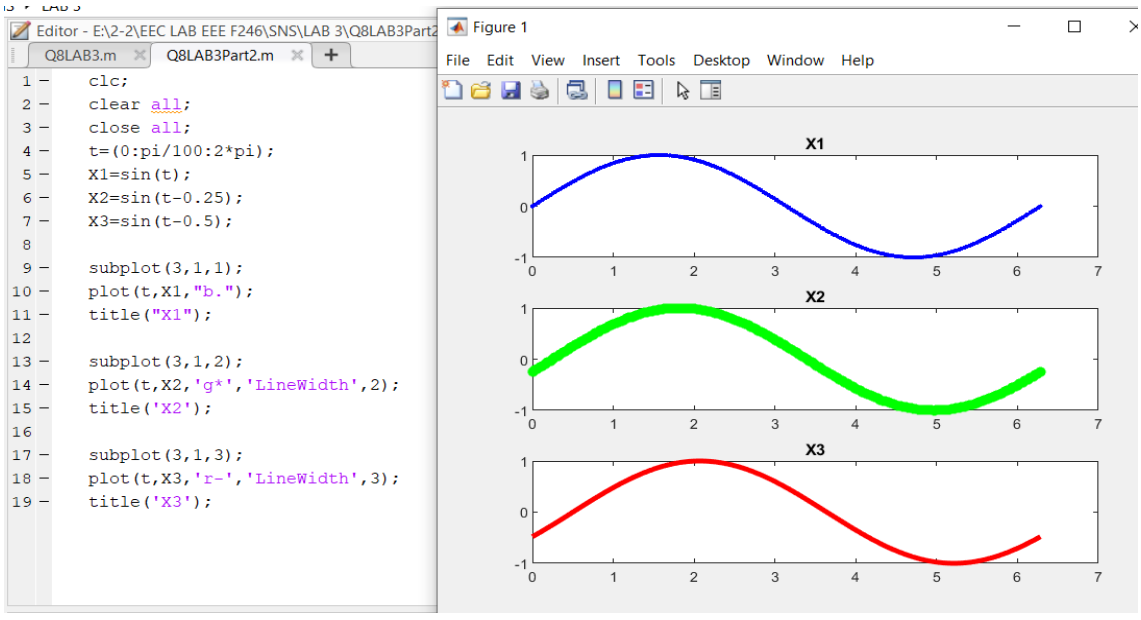
now divide the figure window into subplots and plot X1, X2 and X3 in three separate subplots.

Answer :

(i)



(ii)



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