Lab Report # 04

CSE301 - L Signals & Systems Lab

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Class Section: "A"

Submitted to:

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UET Peshawar

301L: Signals & Systems Lab

LAB ASSESSMENT RUBRICS

Marking Criteria	Exceeds expectation (5-4)	Meets expectation (3-2)	Does not meet expectation (1)	Score
1. Realization of Experiment	Program compiles (noerrors and no warnings). Program always works correctly and meets the specification(s). Completed between 71-100% of the requirements.	Program compiles (no errors and some warnings). Some details of the program specification are violated, program functions incorrectly for some inputs. Completed between 41-70% of the requirements.	Program fails to or compile with lots of warnings. Program only functions correctly in very limited cases or not at all. Completed less than 40% of the requirements.	30%
2. Ability to apply required code utility or data structure	Able to apply required data type or data structure and produce correct results. Familiarize and selects proper functions for simulation of given problem using software tools like MATLAB.	Able to apply required data type or data structure but does not produce correct results. Need guidance to select proper functions for simulation of given problem using software tools like MATLAB.	Unable to identify required data type or data structure. Incapable of selecting proper functions for simulation of given problem using software tools like MATLAB.	20%
3. Documentation	Clearly and effectively documented including descriptions of all variables/functions. Specific purpose is noted for each function, control structure, input requirements and output results.	Basic documentation including descriptions of all variables/functions. Specific purpose is noted for each function and control structure.	No documentation included.	10%

4. Ability to run/debug	Executes Matlab codes without errors, excellent user	Executes Matlab codes without errors. User prompts are	Does not execute Matlab codes due to errors.	20%
	prompts, good use of symbols, spacing in output. Thorough and organized testing has been completed and output from test cases is included.	understandable, minimum use of symbols or spacing in output. Some testing has been completed.	User prompts are misleading or nonexistent. No testing has been completed.	
5. Results compilation	Show processed results effectively by conducting simple computations and plotting using collected data	Show processed results effectively by conducting simple computations and plotting using collected data with minor error	Unable to show processed results effectively by conducting simple computations and plotting using collected data with minor error	10%
6. Efficiency	Excellent use of CPU and Memory.	Good but not smart use of CPU and Memory.	Inefficient use of CPU and Memory.	10%
7. Lab Performance (Team work and Lab etiquettes)	Actively engages and cooperates with other group members in an effective manner. Respectfully and carefully observes safety rules and procedures	Cooperates with other group members in a reasonable manner. Observes safety rules and procedures with minor deviation.	Distracts or discourages other group members from conducting the experiment. Disregards safety rules and procedures.	10%

Instructor:

Name: _____

Signature: _____

Signals & Systems Laboratory

DISCRETE-TIME SIGNAL REPRESENTATION IN MATLAB:

In MATLAB, finite-duration sequence (or discrete time signal) is represented by row matrix/vector of appropriate values. Such representation does not have any information about sample position therefore, for correct representation, two vectors are required, one for x and other for n.

GRAPHICS

Two- and three-dimensional MATLAB graphs can be given titles, have their axes labeled, and have text placed within the graph.

OBJECTIVES OF THE LAB

- Discrete Signal representation in MATLAB
- MATLAB Graphics
- Two Dimensional Plots
- Plot and subplot
- Different Plotting Functions Used in MATLAB

TASK 01

****

CODE:

```
%{
Task-01
x1[n] = [2 5 8 4 3]
x2[n] = [4 3 2]
%}
clear all
clc
%Part A
x1 = [2 5 8 4 3];
x2 = [4 3 2 0 0];
sum = x1+x2;
product = x1.*x2;
%Part B
disp('Addition using loop is ')
for i=1:5
    forSum(1,i)=x1(i)+x2(i);
end
disp(forSum)
for j=1:5
    x4(1,j) = x1(j)*x2(j);
end
disp('Multiplication of signals using loop is: ');
disp(x4);
%Part C
SigPlot(x1, x2, sum, product)

function SigPlot(sig1, sig2, sum, prod)
%seprate Figures
figure (1)
plot(sig1)
title('Signal 1 is ')

figure (2)
plot(sig2)
title('Signal 2 is ')

figure (3)
plot(sum)
title('Signal sum ')

figure (4)
plot(prod)
title('Signal product')
%Overlapping Signals
plot(sig1)
hold on
```

```
plot(sig2)
hold on
plot(sum)
hold on
plot(prod)
%using subplot
subplot(4,1,1)
plot(sig1)
subplot(4,1,2)
plot(sig2)
subplot(4,1,3)
plot(sum)
subplot(4,1,4)
plot(prod)
end
```

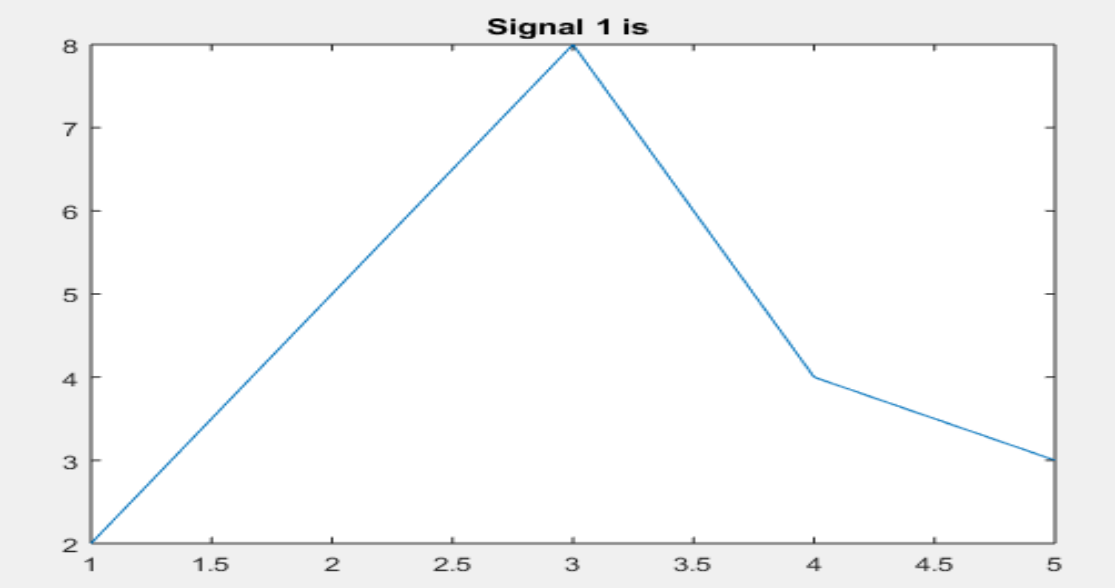
OUPUT:

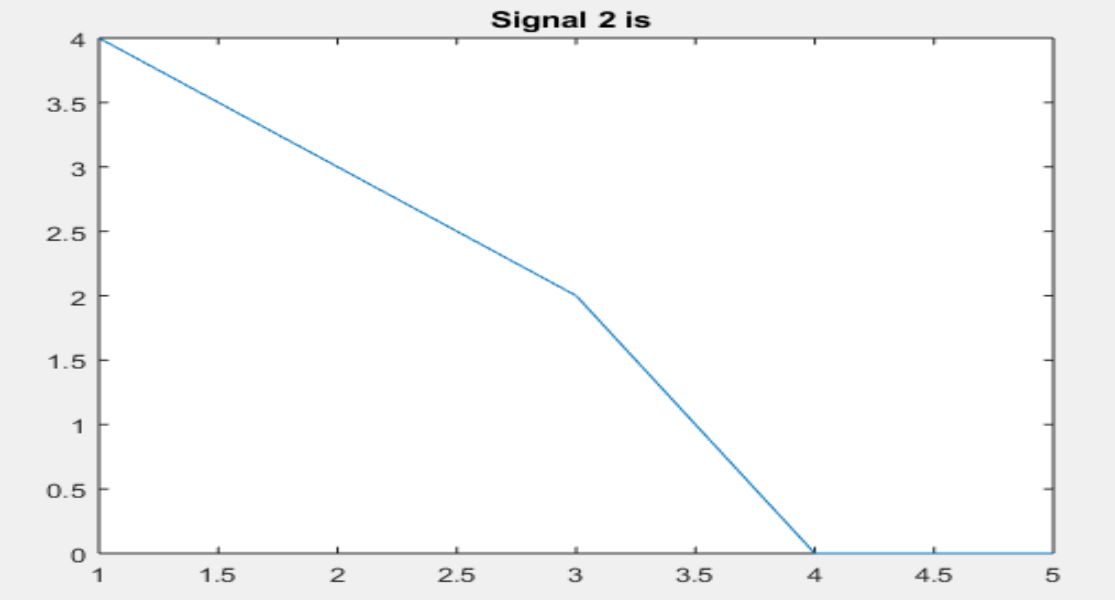
Part(a&b):

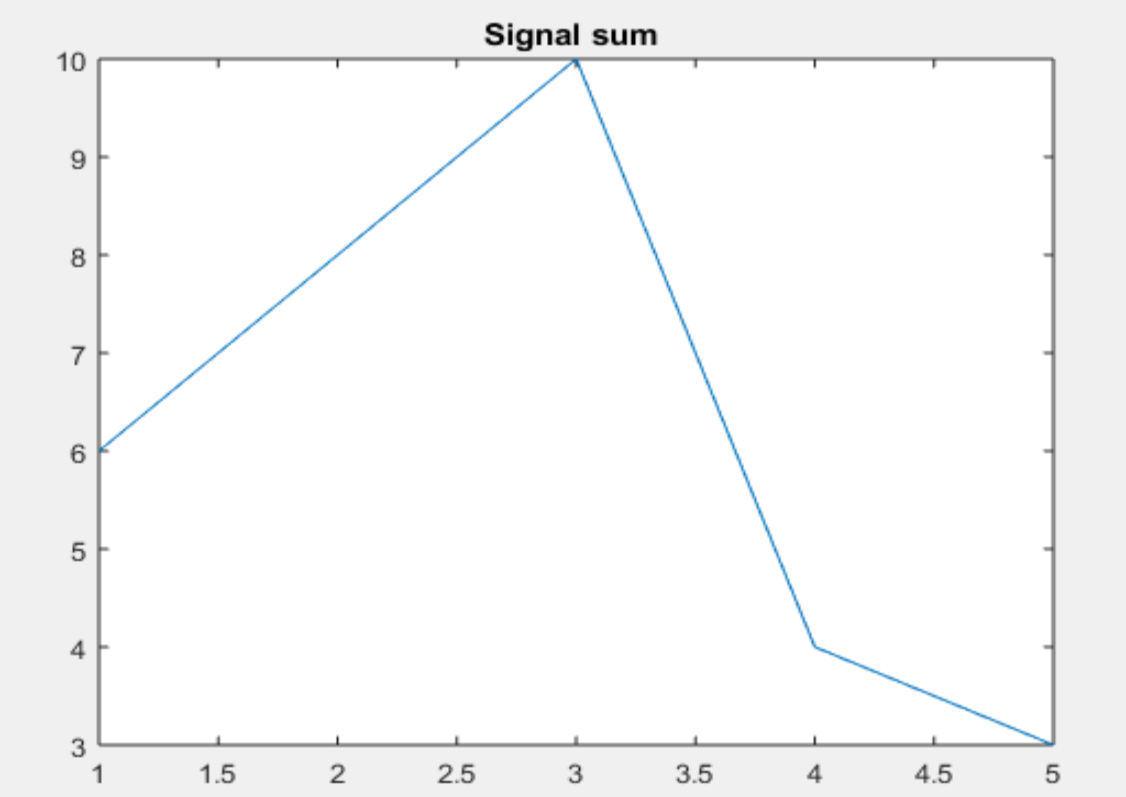
Command Window

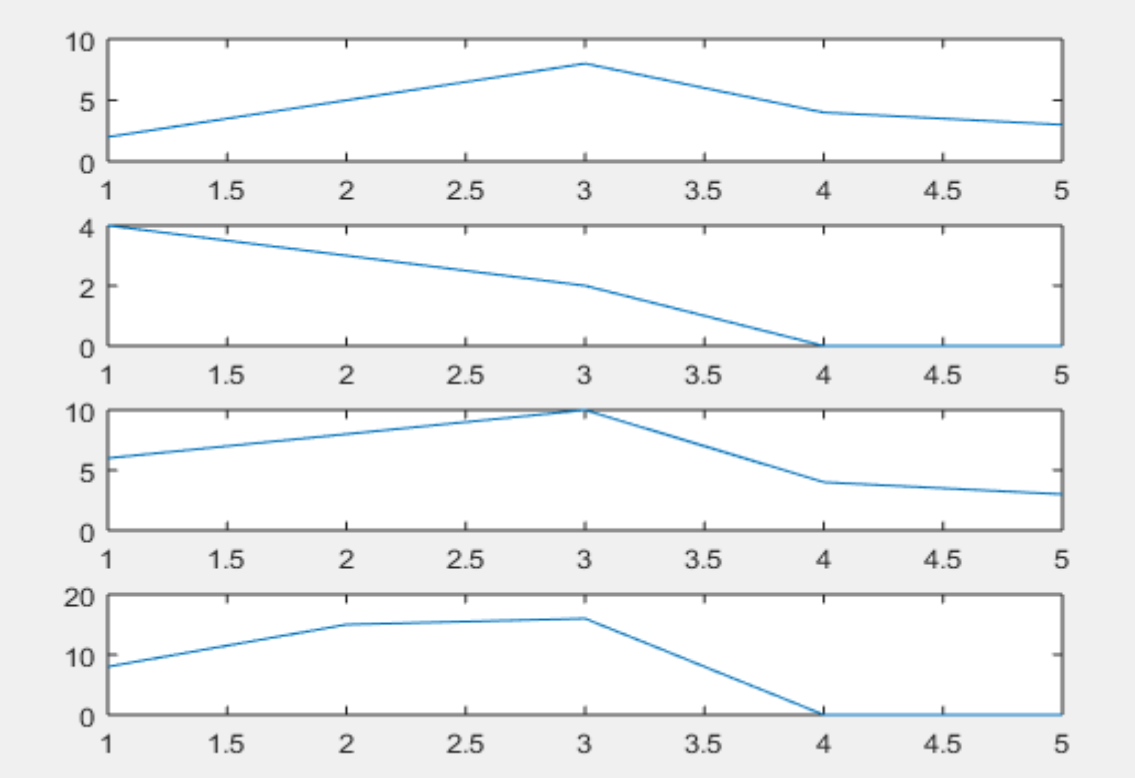
```
sum =

     6     8    10     4     3


product =

     8    15    16     0     0

Addition using loop is
     6     8    10     4     3

Multiplication of signals using loop is:
     8    15    16     0     0

fx >>
```

Part B:


Signal 1 is
8
7
6
5
4
3
2
1
1.5
2
2.5
3
3.5
4
4.5
5


Signal 2 is
4
3.5
3
2.5
2
1.5
1
0.5
0
1
1.5
2
2.5
3
3.5
4
4.5
5


Signal sum
10
9
8
7
6
5
4
3
1
1.5
2
2.5
3
3.5
4
4.5
5


10
5
0
4
2
0
10
5
0
20
10
0
1
1.5
2
2.5
3
3.5
4
4.5
5

TASK 02

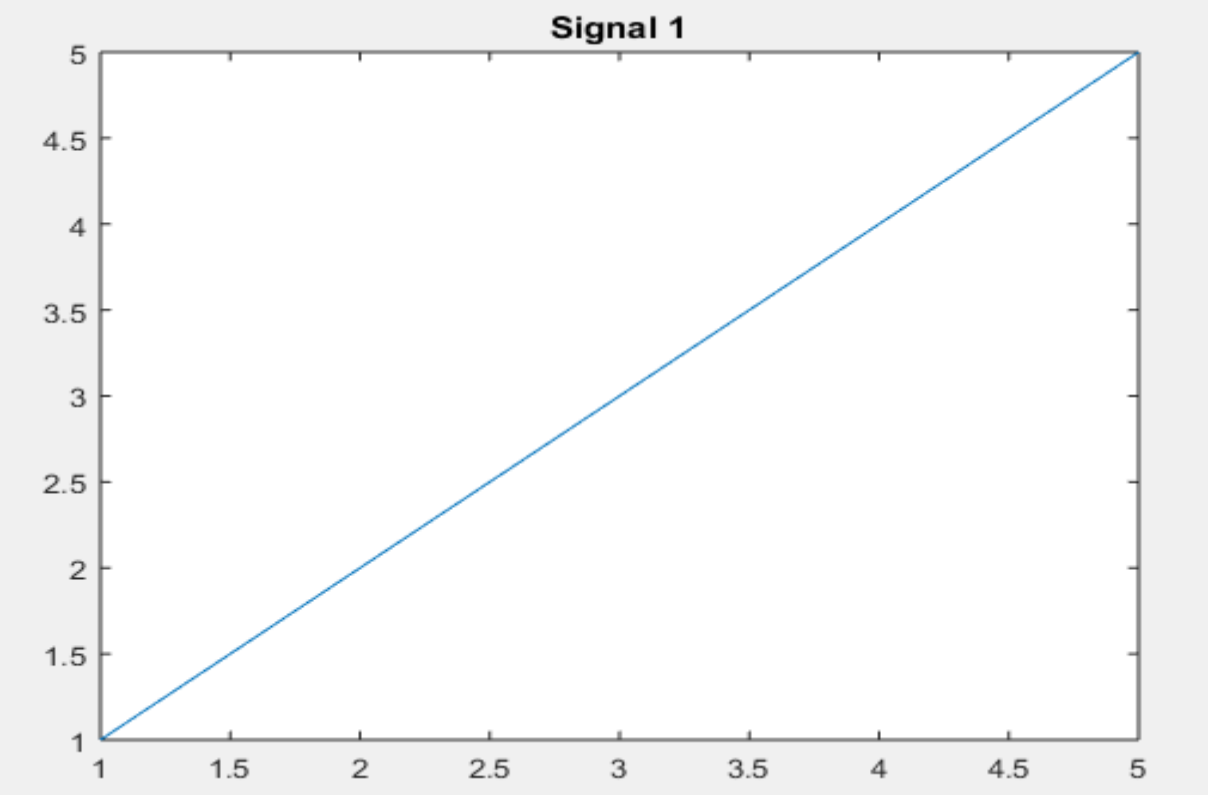
****

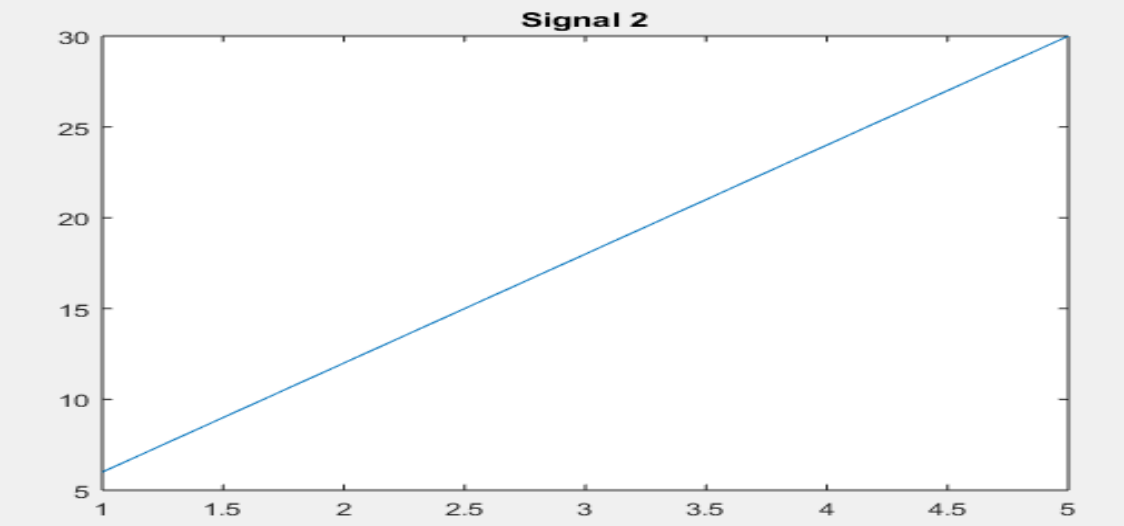
CODE:

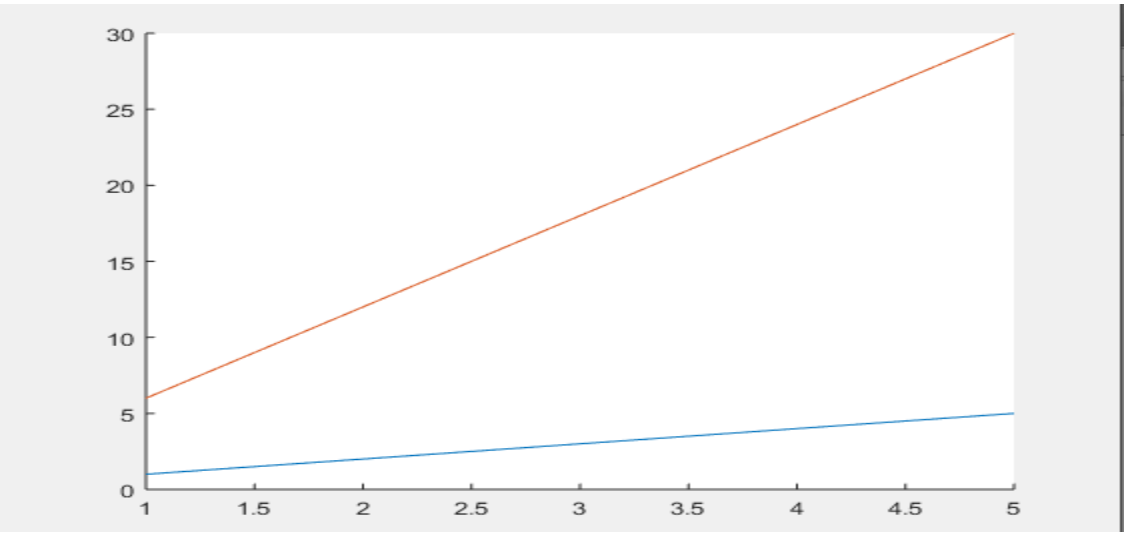
```
%Task-02
clear all
clc
sig = [1 2 3 4 5];
scale=input('Enter Scaling factor value: ')
SigPlot2(sig,ScaleSig(sig,scale))

function[out]= ScaleSig(signal, fact)
out= signal*fact;
end

function SigPlot2(s1, s2)

figure
plot(s1)
title('Signal 1');
figure
plot(s2)
title('Signal 2');
figure

%Now Overlapping Signals
hold on
plot(s1)
hold on
plot(s2)
figure

%Now using subplot
subplot(4,1,1)
plot(s1)
subplot(4,1,2)
plot(s2)
end
```

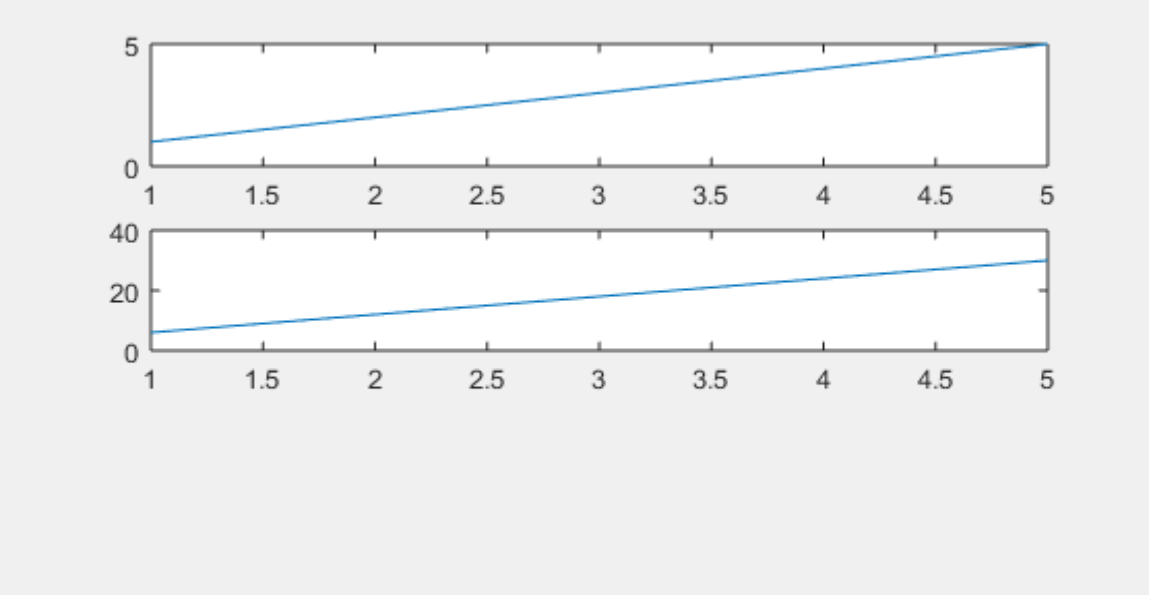
OUPUT:

```
Command Window
Enter Scaling factor value: 6

scale =

     6

fx >>
```




Signal 2
30
25
20
15
10
5
1
1.5
2
2.5
3
3.5
4
4.5
5


30
25
20
15
10
5
0
1
1.5
2
2.5
3
3.5
4
4.5
5


5
0
1
1.5
2
2.5
3
3.5
4
4.5
5
40
20
0
1
1.5
2
2.5
3
3.5
4
4.5
5

TASK 03

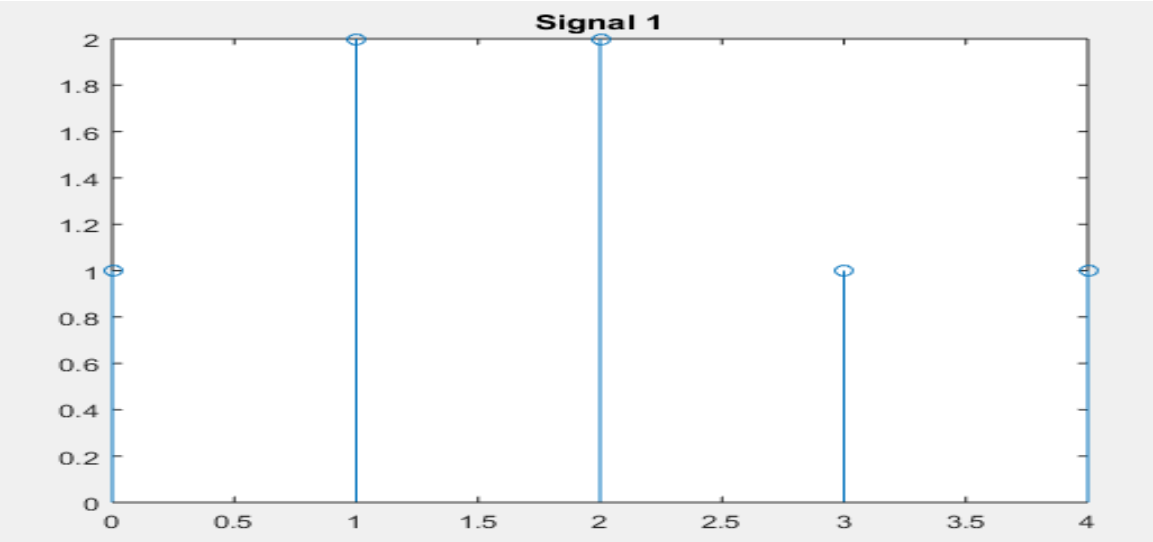
****

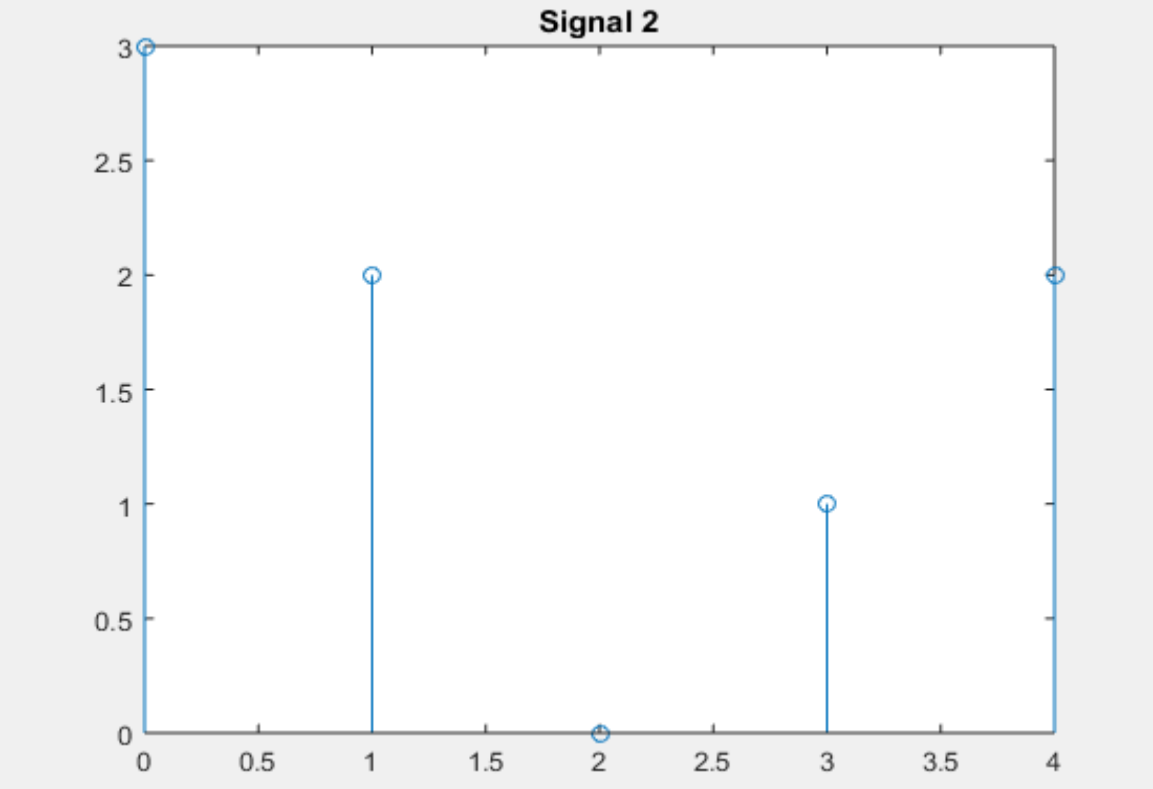
CODE:

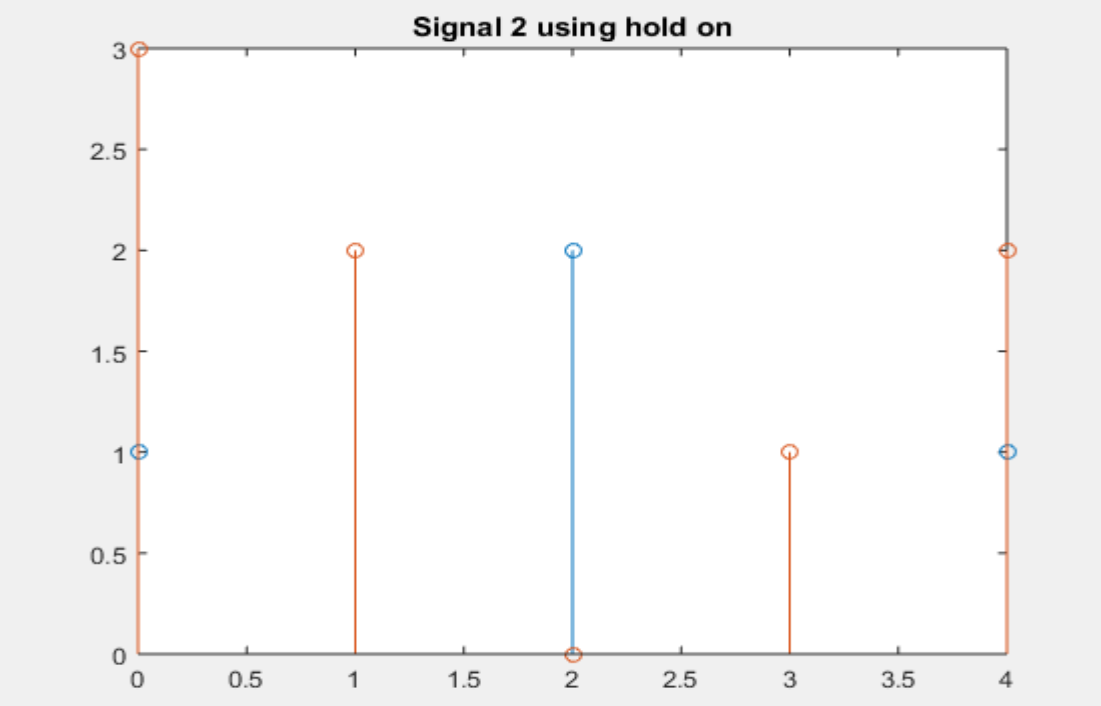
```
clc;
clear all;
close all;
x1=[1 2 2 1 1]; %Given Signal 1
x2=[3 2 0 1 2]; %Given Signal 2
n=[0:4];
Index=[]; %Made to store indexs
y=1;
for i=1:5
    if x1(i)<x2(i)
        Index(y)=i-1;
        y=y+1;
    end
end
disp('x2 has smaller amplitude on following Indexs: ');
disp(Index);
Sigplot3(x1,x2,n)

function Sigplot3(sig1,sig2,n)
%For seprate widnow
figure
stem(n,sig1);
title('Signal 1')
figure
stem(n,sig2);
title('Signal 2')
figure

%On same Window
stem(n,sig1);
title('Signal 1 using hold on')
hold on
stem(n,sig2);
title('Signal 2 using hold on')
hold on
figure

%Different but same window
subplot(2,1,1);
stem(n,sig1);
title('Signal 1 using subplot')
hold on
subplot(2,1,2);
stem(n,sig2);
title('Signal 2 using subplot')
hold on
```

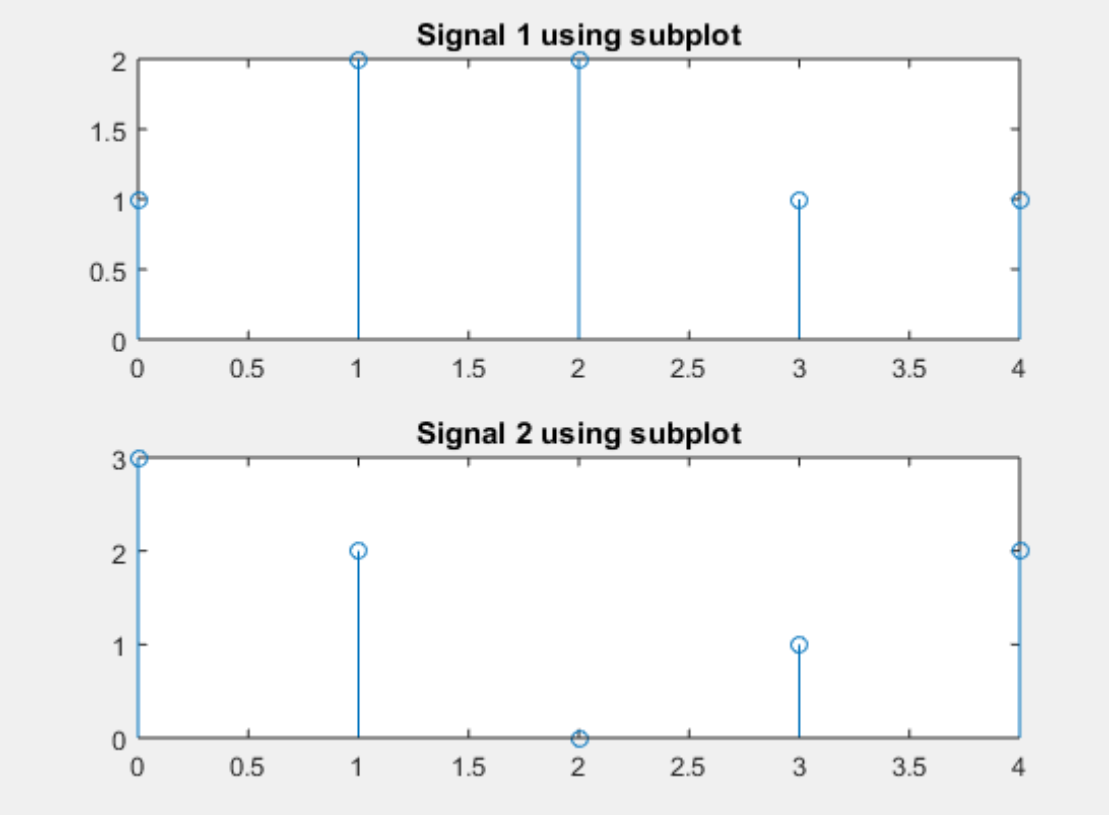
OUPUT:

```
Command Window
x2 has smaller amplitude on following Indexs:
     0     4

fx >>
```






Signal 2 using hold on
3
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
3.5
4


Signal 1 using subplot
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
3.5
4
Signal 2 using subplot
3
2
1
0
0
0.5
1
1.5
2
2.5
3
3.5
4

TASK 04

****

CODE:

```
clc;
clear all;
close all;
i=1;
T1=[-15:15];
T2=[-50:+50];

for x=-15:15
    y1(1,i)=(2)*(x.^2);
    y2(1,i)=(4)*(x.^3);
    i=i+1;
end

figure
subplot(2,1,1)
plot(T1,y1,' -*')
hold on
title('Signal y1 w.r.t T1');
subplot(2,1,2)
plot(T1,y2,'-.')
hold on
title('Signal y2 w.r.t T1');
i=1;

for x=-50:50
    y1(1,i)=(2)*(x.^2);
    y2(1,i)=(4)*(x.^3);
    i=i+1;
end

figure
subplot(2,1,1)
plot(T2,y1,'-*')
hold on
title('Signal y1 w.r.t T2');
subplot(2,1,2)
plot(T2,y2,'-.')
hold on
title('Signal y2 w.r.t T2');
```

OUPUT:

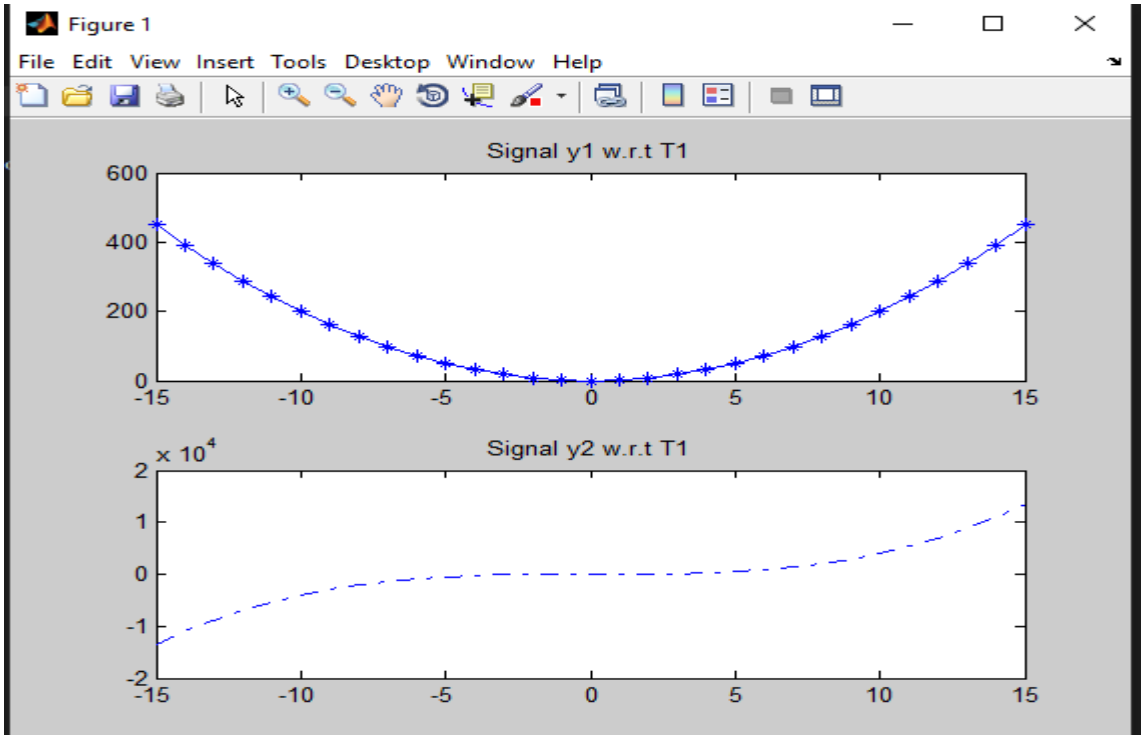


Figure 1
File Edit View Insert Tools Desktop Window Help
Signal y1 w.r.t T1
600
400
200
0
-15 -10 -5 0 5 10 15
Signal y2 w.r.t T1
x 10^4
2
1
0
-1
-2
-15 -10 -5 0 5 10 15

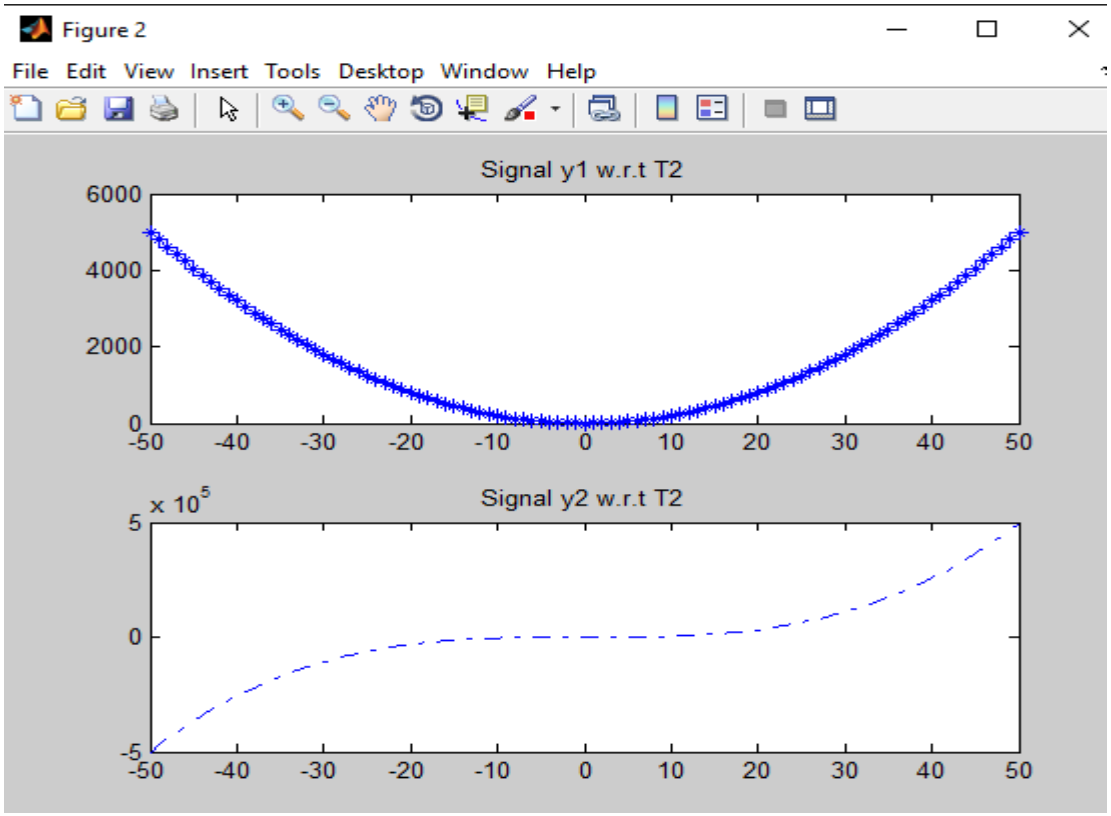


Figure 2
File Edit View Insert Tools Desktop Window Help
Signal y1 w.r.t T2
6000
4000
2000
0
-50 -40 -30 -20 -10 0 10 20 30 40 50
Signal y2 w.r.t T2
x 10^5
5
0
-5
-50 -40 -30 -20 -10 0 10 20 30 40 50

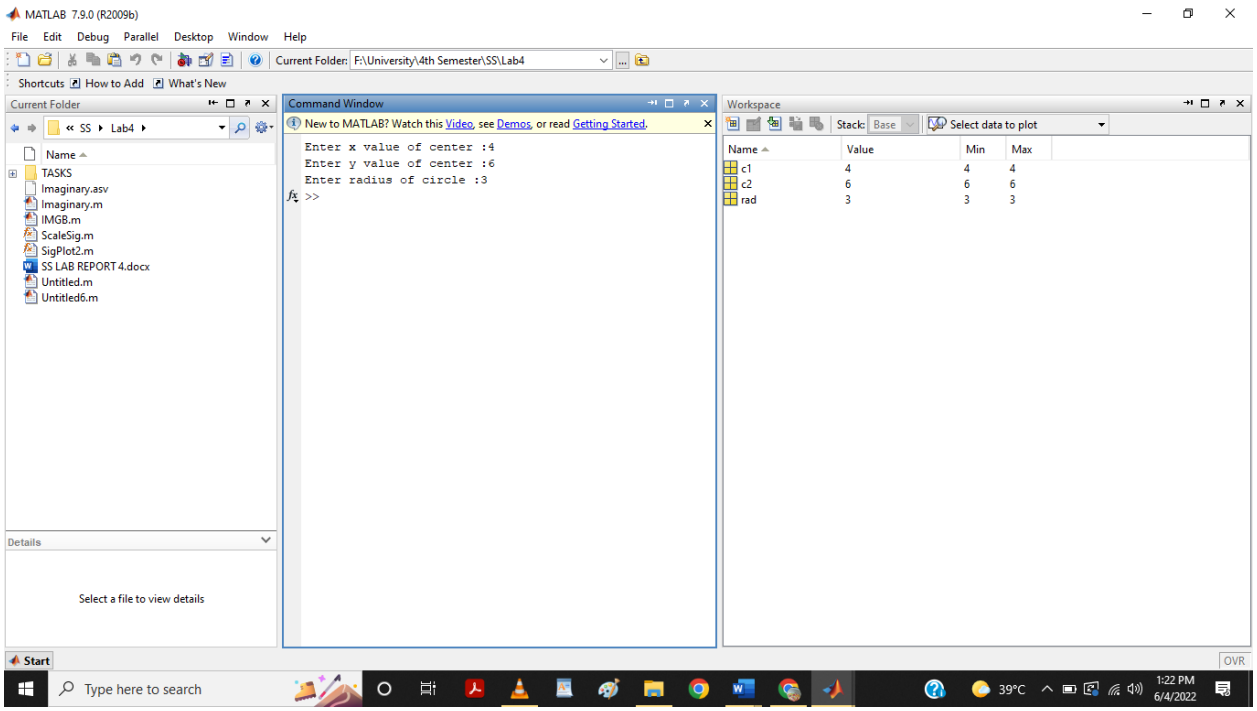
TASK 05

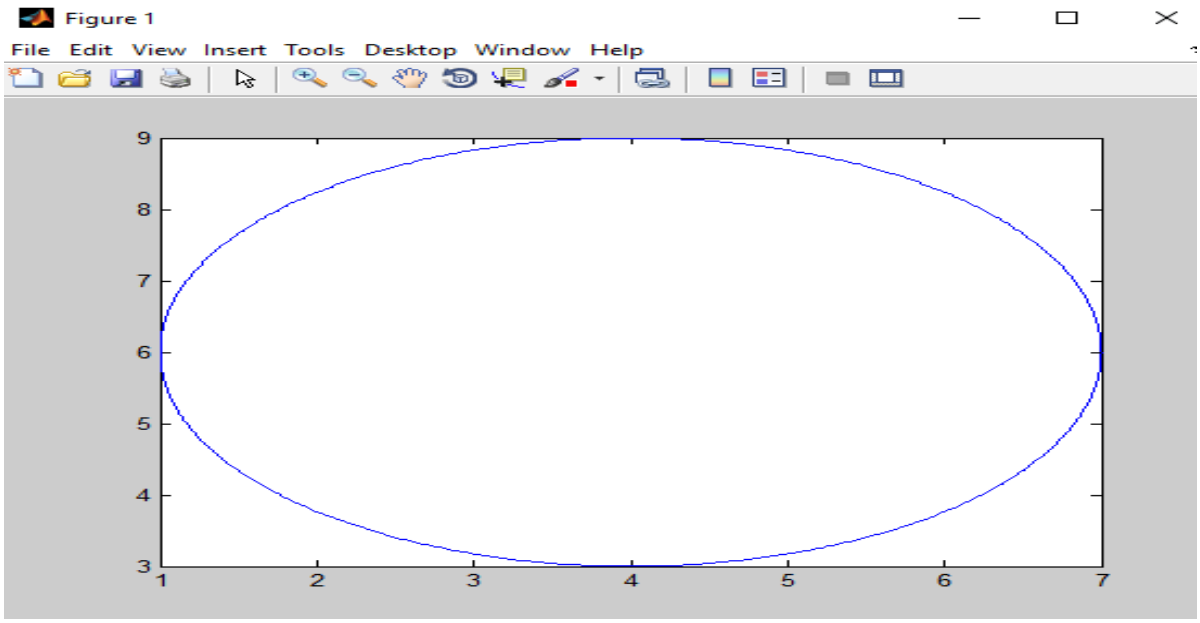
****

CODE:

```
clc;
close all;
clear all;
c1=input('Enter x value of center :');
c2=input('Enter y value of center :');
rad=input('Enter radius of circle :');
PlotCircle(c1,c2,rad)

PlotCircle Function:

function PlotCircle(x,y,r)
theta=[0:1/100:2*pi];
xe=(r*cos(theta))+x;
ye=(r*sin(theta))+y;
figure
plot(xe,ye)
```

OUPUT:





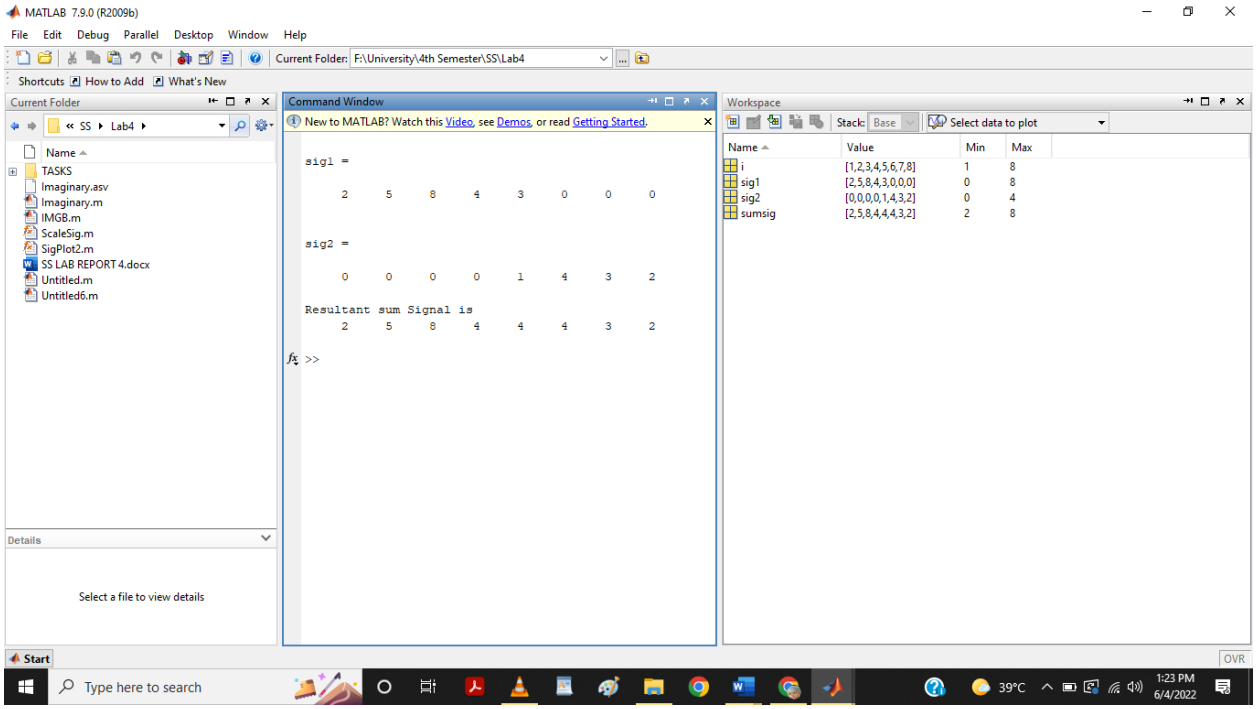
TASK 06

****

CODE:

```
sig1=[2,5,8,4,3,0,0,0] % Signal 1 given
sig2=[0,0,0,0,1,4,3,2] % Signal 2 given
i=1:8; %There are 8 enteries

%sumsig is sum of two signals
sumsig=sig1+sig2;
disp('Resultant sum Signal is');
disp(sumsig);

%plotting sig1
subplot(3,1,1)
plot(sig1,i,'r -*')
title('Signal 1')

%plotting sig2
subplot(3,1,2)
plot(sig2,i,'g -.')
title('Signal 2')

%plotting sumsig
subplot(3,1,3)
plot(sumsig,i,'b -*')
title('Sum Signal')
```

OUPUT:


MATLAB 7.9.0 (R2009b)
File Edit Debug Parallel Desktop Window Help
Current Folder: F:\University\4th Semester\SS\Lab4
Shortcuts How to Add What's New
Current Folder
SS Lab4
Name
TASKS
Imaginary.asv
Imaginary.m
IMG8.m
ScaleSig.m
SigPlot2.m
SS LAB REPORT 4.docx
Untitled.m
Untitled6.m
Details
Select a file to view details
Command Window
New to MATLAB? Watch this Video, see Demos, or read Getting Started.
sig1 =
2 5 8 4 3 0 0 0
sig2 =
0 0 0 0 1 4 3 2
Resultant sum Signal is
2 5 8 4 4 4 3 2
>>
Workspace
Stack: Base
Select data to plot
Name Value Min Max
i [1,2,3,4,5,6,7,8] 1 8
sig1 [2,5,8,4,3,0,0,0] 0 8
sig2 [0,0,0,0,1,4,3,2] 0 4
sumsig [2,5,8,4,4,4,3,2] 2 8
Start
Type here to search
39°C
1:23 PM
6/4/2022
OVR

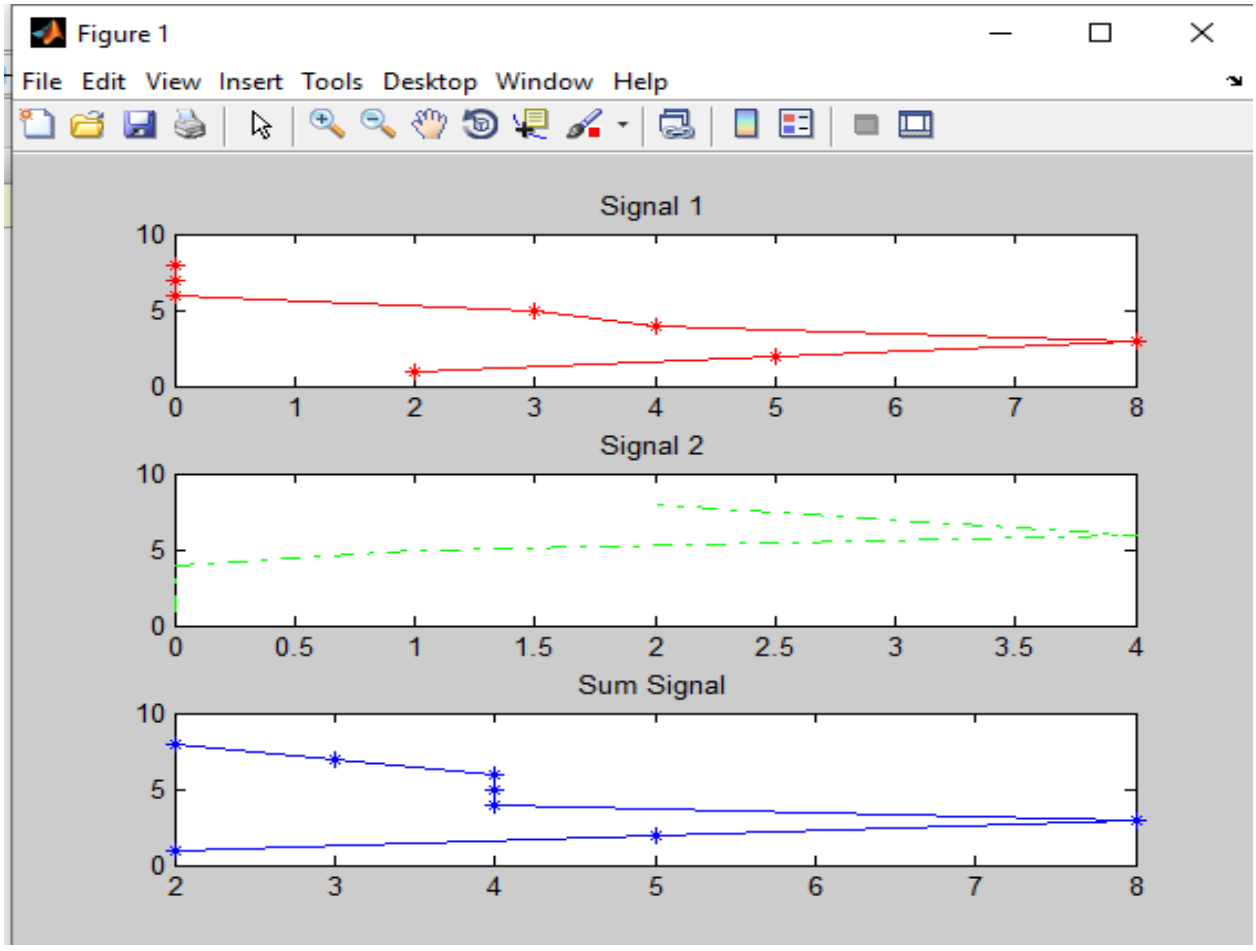


Figure 1
File Edit View Insert Tools Desktop Window Help
Signal 1
Signal 2
Sum Signal

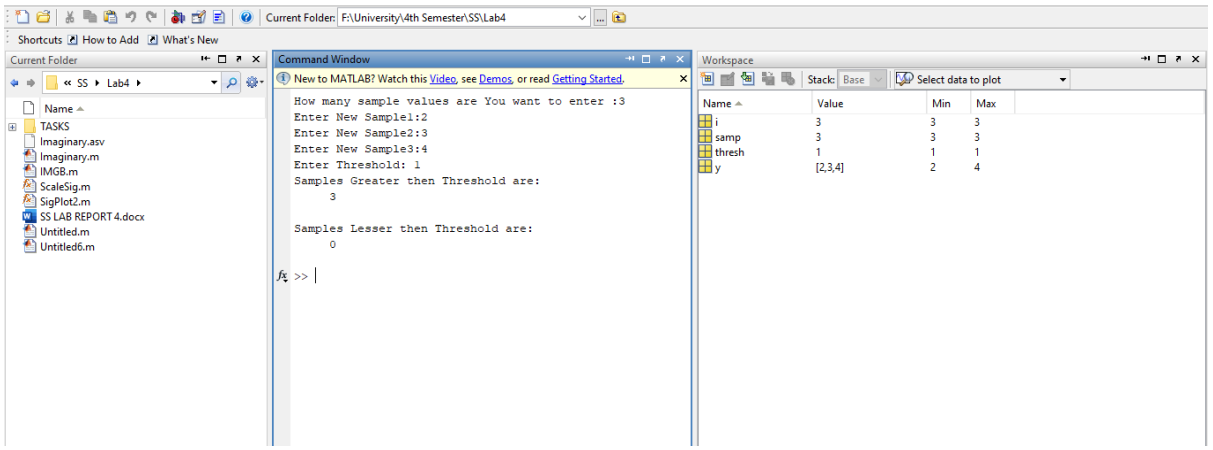
TASK 07

****

CODE:

```
clc;
clear all;
close all;

%num2str() function converts number to string that is how we will take
%signal from user below in this program
samp=input('How many sample values are You want to enter :');
%Above we are getting number about how many samples entered
for i=1:samp
    y(i)=input(['Enter New Sample' num2str(i) ':']);
end
%Getting Threshold value
thresh=input('Enter Threshold: ');
AmpScale(y,thresh)

AmpScale Function:
function AmpScale(sig,t)
greater=0; %for samples greater than t
less=0;    %for samples less than -t\

%numel(sig) is functon that will calculate number of element in signal sig
for i=1:1:numel(sig)
    if sig(i)>t
        sig(i)=sig(i)-t;
        greater=greater+1;
    end
    if sig(i)<-t
        sig(i)=sig(i)+t;
        less=less+1;
    end
end
disp('Samples Greater then Threshold are: ');
disp(greater);
disp('Samples Lesser then Threshold are: ');
disp(less);
figure
plot(sig,i)
```

OUPUT:



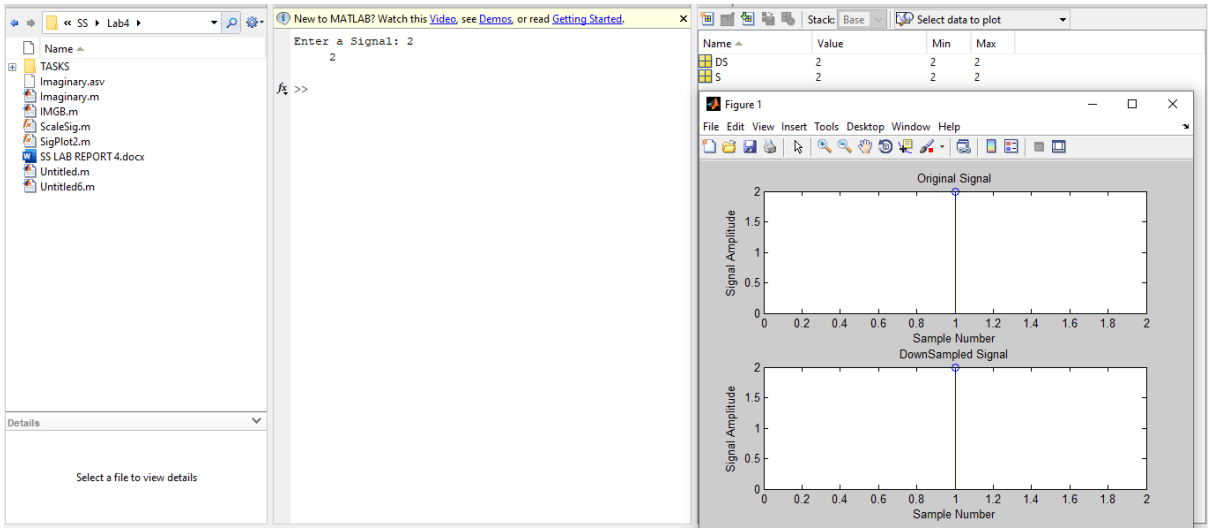
TASK 08

****

CODE:

```
function DS=Downsample(S)
j=1;
for i=1:length(S)
    if(mod(i,2)~=0)
        DS(j)=S(i);
         j=j+1;
    end
end
end

S = input('Enter a Signal: ');
DS = Downsample(S);

disp(DS);
%figure
subplot(2,1,1)
stem(S);
title('Original Signal')
xlabel('Sample Number')
ylabel('Signal Amplitude')

%figure2
subplot(2,1,2)
stem(DS);
title('DownSampled Signal')
xlabel('Sample Number')
ylabel('Signal Amplitude')
```

OUPUT:



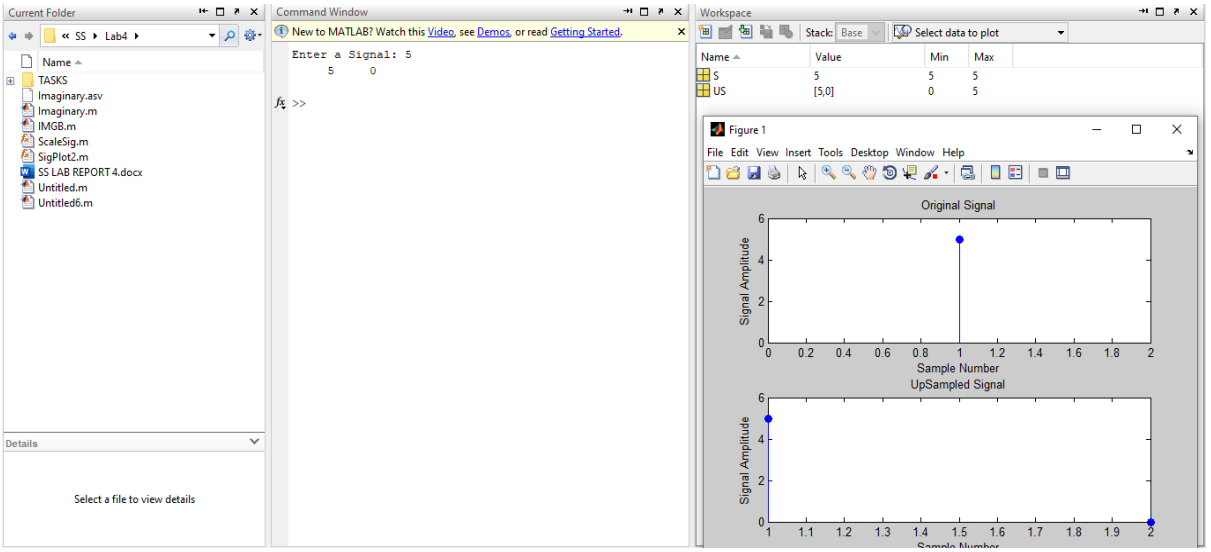
TASK 09

****

CODE:

```
function US=Upsample(S)
 j=1;
for i=1:2*length(S)
    if(mod(i,2)==0)
       US(i)=0;
    else
       US(i)=S(j);
       j=j+1;
    end
end

S = input('Enter a Signal: ');
US = Upsample (S);

disp(US);
%figure
subplot(2,1,1)
stem(S, 'filled');
title('Original Signal')
xlabel('Sample Number')
ylabel('Signal Amplitude')
%figure2
subplot(2,1,2)
stem(US, 'filled');
title('UpSampled Signal')
xlabel('Sample Number')
ylabel('Signal Amplitude')
```

OUPUT:


Current Folder
« SS ▸ Lab4 ▸
Name
TASKS
Imaginary.asv
Imaginary.m
IMGB.m
ScaleSig.m
SigPlot2.m
SS LAB REPORT 4.docx
Untitled.m
Untitled6.m
Details
Select a file to view details
Command Window
New to MATLAB? Watch this Video, see Demos, or read Getting Started.
Enter a Signal: 5
5 0
>>
Workspace
Stack: Base
Select data to plot
Name
Value
Min
Max
S
5
5
5
US
[5,0]
0
5
Figure 1
File Edit View Insert Tools Desktop Window Help
Original Signal
Signal Amplitude
Sample Number
UpSampled Signal
Signal Amplitude

TASK 10

****

CODE:

```
clc;
clear all;
close all;
[x,y]=meshgrid([-2:.2:2]);
z= x.*exp(-x.^2-y.^2);
figure
surf(x,y,z,gradient(z))
colorbar
```

OUPUT: