Lab Report-01

Course no. ECE 4124
Course Title: Digital Signal Processing Sessional

Experiment Title: MATLAB implementation of-

1. Plotting mirror signal, delayed signal and advanced signal of a continuous signal.
2. Plotting mirror signal, delayed signal and advanced signal of a discrete signal.
3. Convoluting two signals with and without using conv() function.

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Experiment No.: 01
Experiment Name: MATLAB implementation of-

1. Plotting mirror signal, delayed signal and advanced signal of a continuous signal.
2. Plotting mirror signal, delayed signal and advanced signal of a discrete signal.
3. Convoluting two signals with and without using conv() function.

Theory:

A continuous signal or a continuous-time signal is a varying quantity whose domain, which is often time, is a continuum. That is, the function's domain is an uncountable set. The function itself need not to be continuous.

A discrete signal or discrete-time signal is a time series consisting of a sequence of quantities. Unlike a continuous-time signal, a discrete-time signal is not a function of a continuous argument; however, it may have been obtained by sampling from a continuous-time signal.

The convolution of two signals in the time domain is equivalent to the multiplication of their representation in frequency domain.

$y(n)=x(n)*h(n)$

Mathematically, we can write the convolution of two signals as-

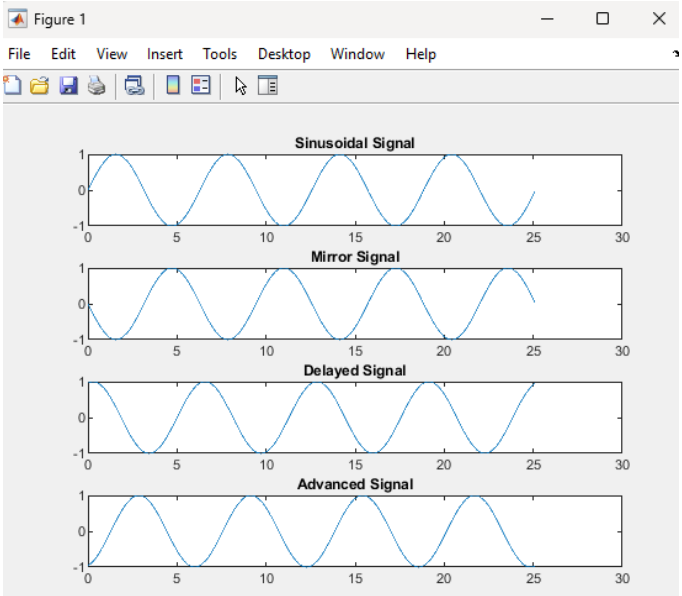
$$y(n) = \sum_{k=-\infty}^{\infty} \mathrm{x(k)} * \mathrm{h(n-k)}$$

1. Plotting mirror signal, delayed signal and advanced signal of a continuous signal:

Code:

```
t=0:.01:8*pi;
y=sin(t);
subplot(4,1,1);
plot(t,y);
title("Sinusoidal Signal");

subplot(4,1,2);
plot(t,-y);
title("Mirror Signal");

subplot(4,1,3);
d=sin(t-5);
plot(t,d);
title("Delayed Signal");

subplot(4,1,4);
a=sin(t+5);
plot(t,a);
title("Advanced Signal");
```

Output:

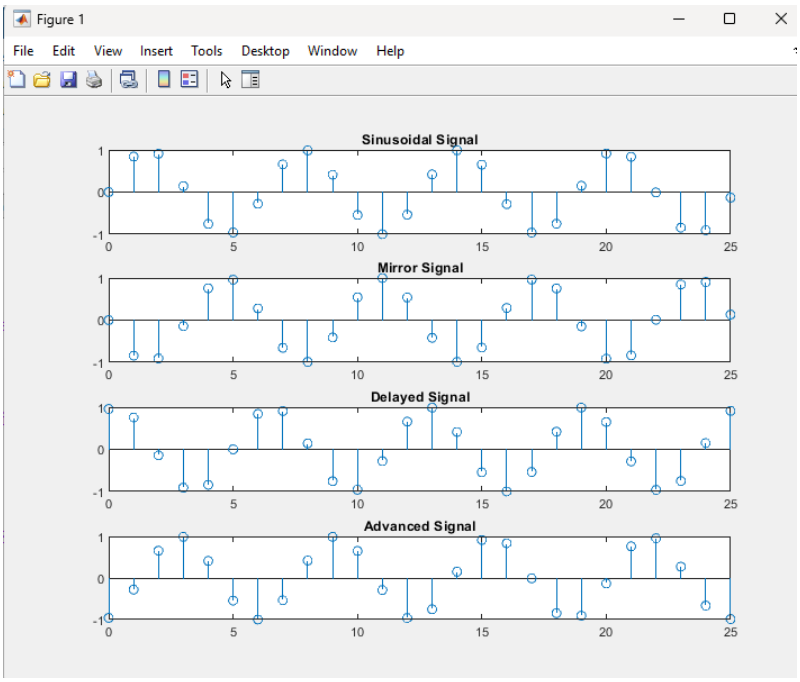


2. Plotting mirror signal, delayed signal and advanced signal of a discrete signal.

Code:

```
t=0:1:8*pi;
y=sin(t);
subplot(4,1,1);
stem(t,y);
title("Sinusoidal Signal");

subplot(4,1,2);
stem(t,-y);
title("Mirror Signal");

subplot(4,1,3);
d=sin(t-5);
stem(t,d);
title("Delayed Signal");

subplot(4,1,4);
a=sin(t+5);
stem(t,a);
title("Advanced Signal");
```

Output:



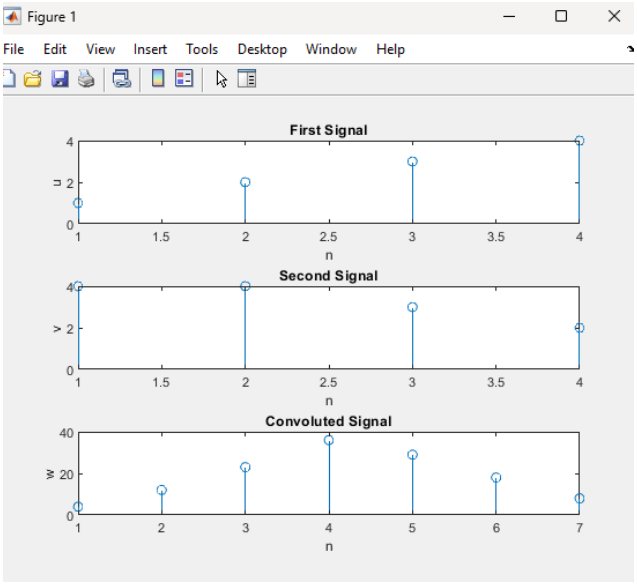
3. Convoluting two signals with and without using conv() function:

With conv() Function:

Code:

```
u=[1 2 3 4];
v=[4 4 3 2];
w= conv(u,v);

subplot(3,1,1);
stem(u);
xlabel('n');
ylabel('u');
title('First Signal');

subplot(3,1,2);
stem(h);
xlabel('n');
ylabel('v');
title('Second Signal');

subplot(3,1,3);
stem(w);
ylabel('w');
xlabel('n');

title('Convoluted Signal');
```

Output:

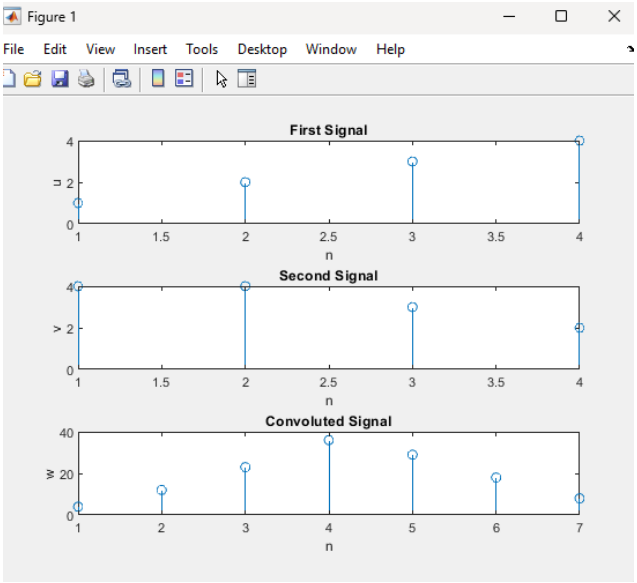


Without conv() Function:

Code:

```
x=[1 2 3 4];
h=[4 4 3 2];
m=length(x);
n=length(h);
X=[x,zeros(1,n)];
H=[h,zeros(1,m)];
for i=1:n+m-1
    Y(i)=0;
    for j=1:m
        if(i-j+1>0)
            Y(i)=Y(i)+X(j)*H(i-j+1);
        else
        end
    end

end


subplot(3,1,1);
stem(x);
xlabel('n');
ylabel('x[n]');
title('First Signal');

subplot(3,1,2);
stem(h);
xlabel('n');
ylabel('h[n]');
title('Second Signal');

subplot(3,1,3);
stem(Y);
ylabel('Y[n]');
xlabel('n');

title('Convoluted Signal');
```

Output:



Conclusion: Thus we have successfully implemented all the signals in MATLAB. The output was found as expected.