

DIGITAL SIGNAL PROCESSING

PROJECT-1

SOLVING DIFFERENTIAL EQUATION AND FINDING THE IMPULSE RESPONSE OF THE SYSTEM

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M - FILE

```
clc;
clear all;
close all;
b=input('Enter the coefficients of x: ');
a=input('Enter the coefficients of y: ');
M=length(b)-1;
N=length(a)-1;
IC=input('Enter the initial conditions for y: ');
n=[-N:20]; %number of terms
%x[n]=u[n]-u[n-2]
x=[(n>=0)]-[(n>=2)];
subplot(211);
stem(n,x);
title('input sequence x[n]');
xlabel('n');
ylabel('x[n]');
y=[IC zeros(1,length(n)-N)];
```

```

for n=N+1:20 % loop runs length(n) times to find y(n)
sumx=0;
sumy=0;
for k=0:M
sumx=sumx+(b(k+1)*x(n-k));
end
for k=1:N
sumy=sumy+(a(k+1)*y(n-k));
end
y(n)=sumx-sumy;
end
n=[-N:20]; %number of terms
subplot(212);
stem(n,y);
title('output sequence y[n] (C15) ');
xlabel('n');
ylabel('y[n]');
disp('y[n]=');
disp(y)

```

OUTPUT SNAPSHOTS

Enter the coefficients of x: [1 0.5]

Enter the coefficients of y: [1 -0.25 -0.125]

Enter the initial conditions for y: [2 1]

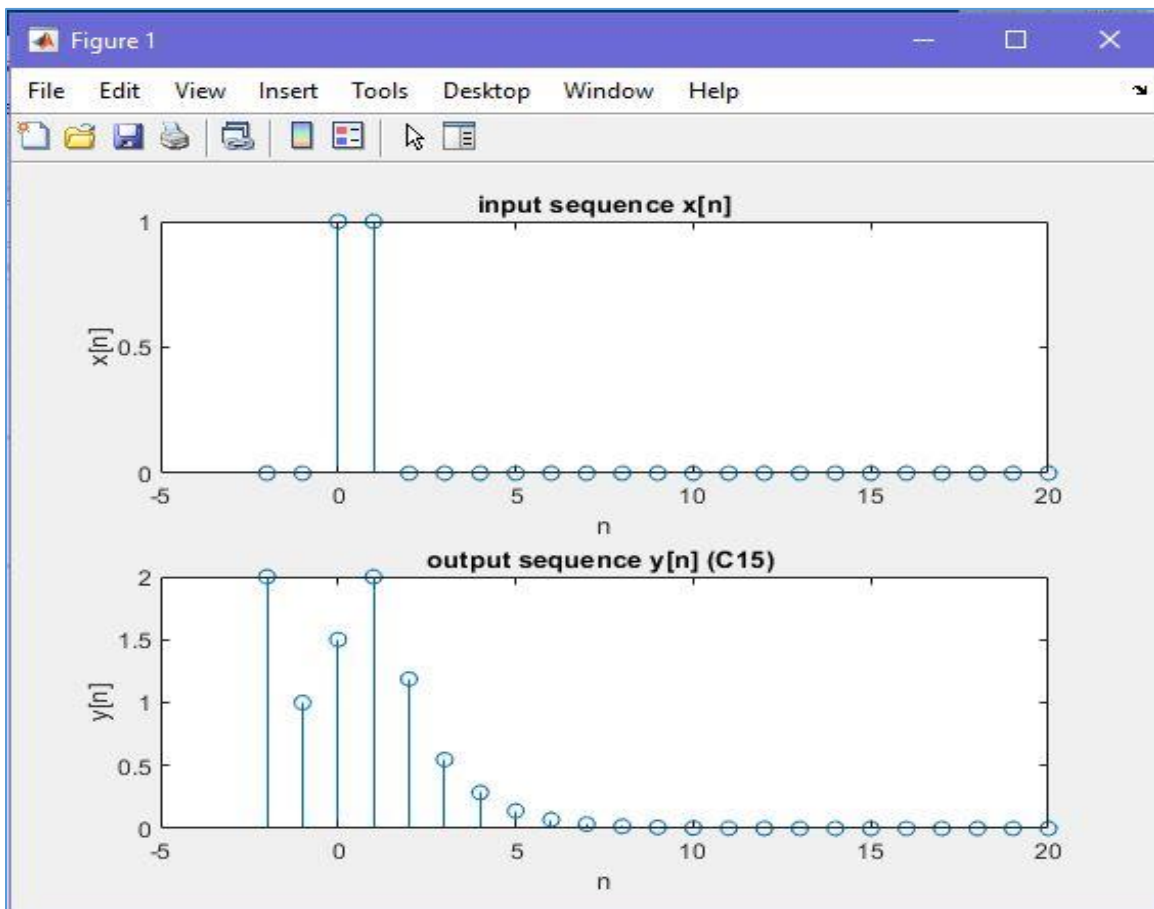
$y[n]=$

Columns 1 through 12

2.0000 1.0000 1.5000 2.0000 1.1875 0.5469 0.2852 0.1396 0.0706 0.0351
0.0176 0.0088

Columns 13 through 23

0.0044 0.0022 0.0011 0.0005 0.0003 0.0001 0.0001 0.0000 0 0 0



Enter the coefficients of x: [1 0.5]

Enter the coefficients of y: [1 -0.25 -0.125]

Enter the initial conditions for y: [0 0]

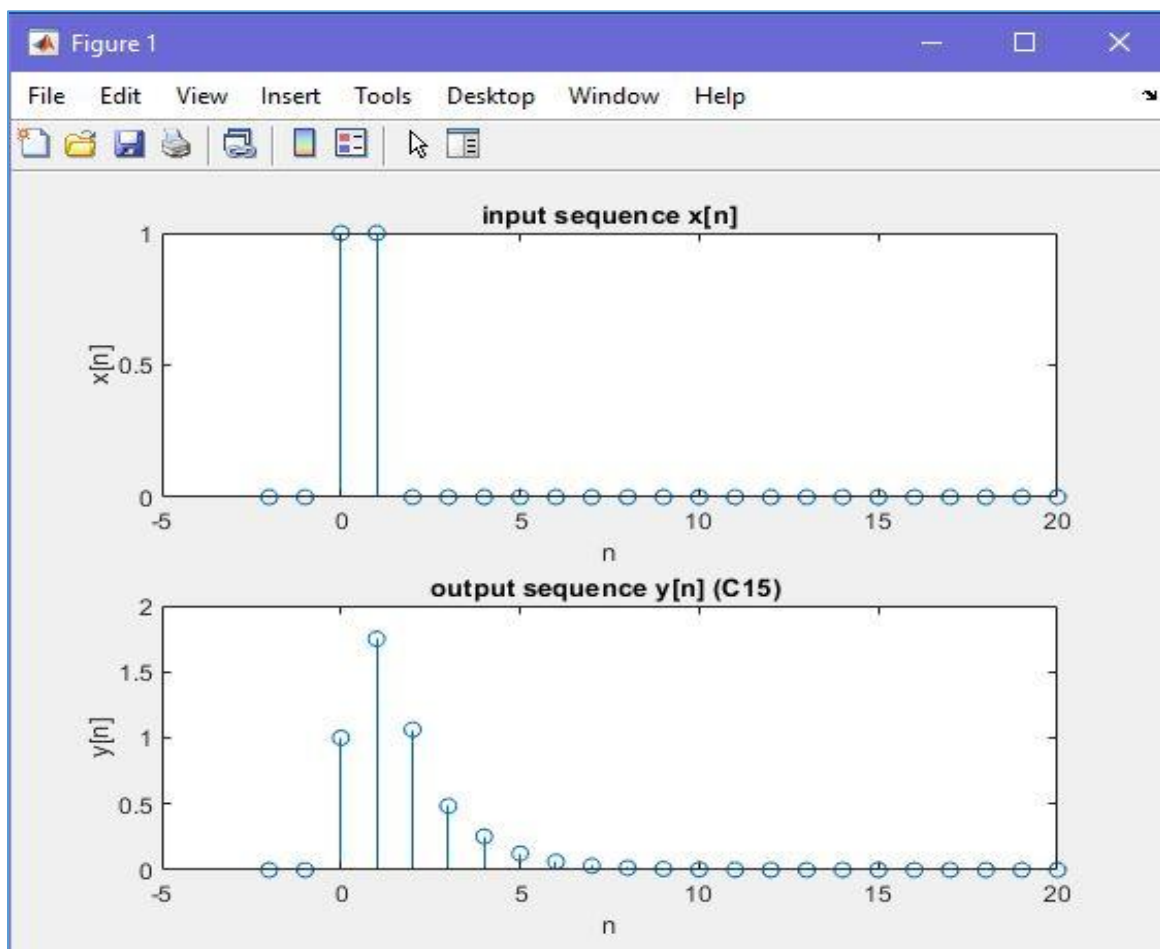
$y[n]=$

Columns 1 through 12

1.0000 1.7500 1.0625 0.4844 0.2539 0.1240 0.0627 0.0312 0.0156 0.0078
0.0039 0.0020

Columns 13 through 21

0.0010 0.0005 0.0002 0.0001 0.0001 0.0000 0.0000 0.0000 0.0000



CONCLUSION: The difference equation is a formula for computing an output sample at time based on past and present input samples and past output samples in time domain with help of impulse.

In signal processing, the impulse response of a dynamic system is its output when presented with a brief input signal, called an impulse. It defines the response of a linear time- invariant system for all frequencies