Program to solve difference equation and to find the Impulse response of the system

GROUP A4

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m-FILE

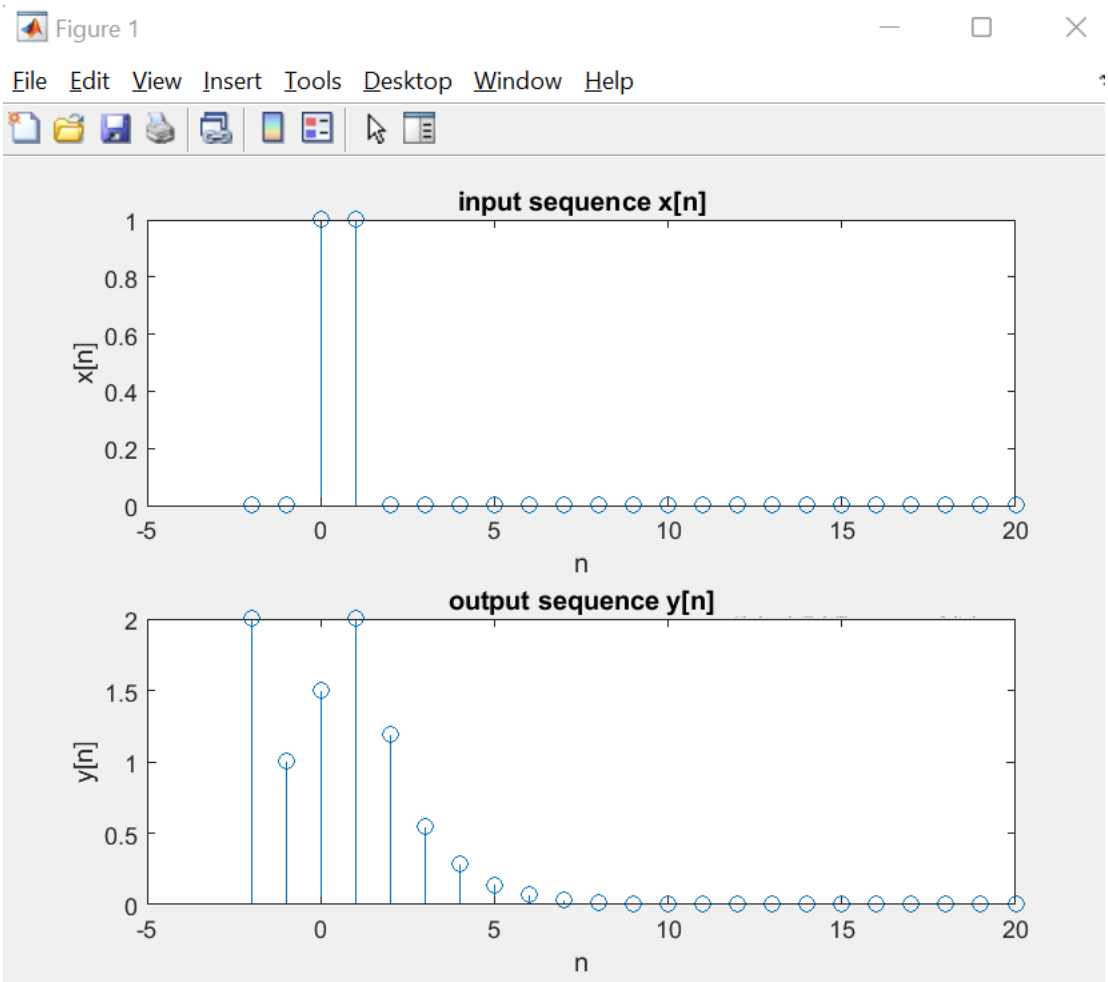
PROJECT1.m

```
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]');
xlabel('n');
ylabel('y[n]');
disp('y[n]=');
disp(y)
```

TERMINAL OUTPUT:

```
Command Window
>> PROJECT1
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 11

    2.0000    1.0000    1.5000    2.0000    1.1875    0.5469    0.2852    0.1396    0.0706    0.0351    0.0176

  Columns 12 through 22

    0.0088    0.0044    0.0022    0.0011    0.0005    0.0003    0.0001    0.0001    0.0000         0         0

  Column 23

         0

fx >>
```

PLOT:



IMPULSE RESPONSE:

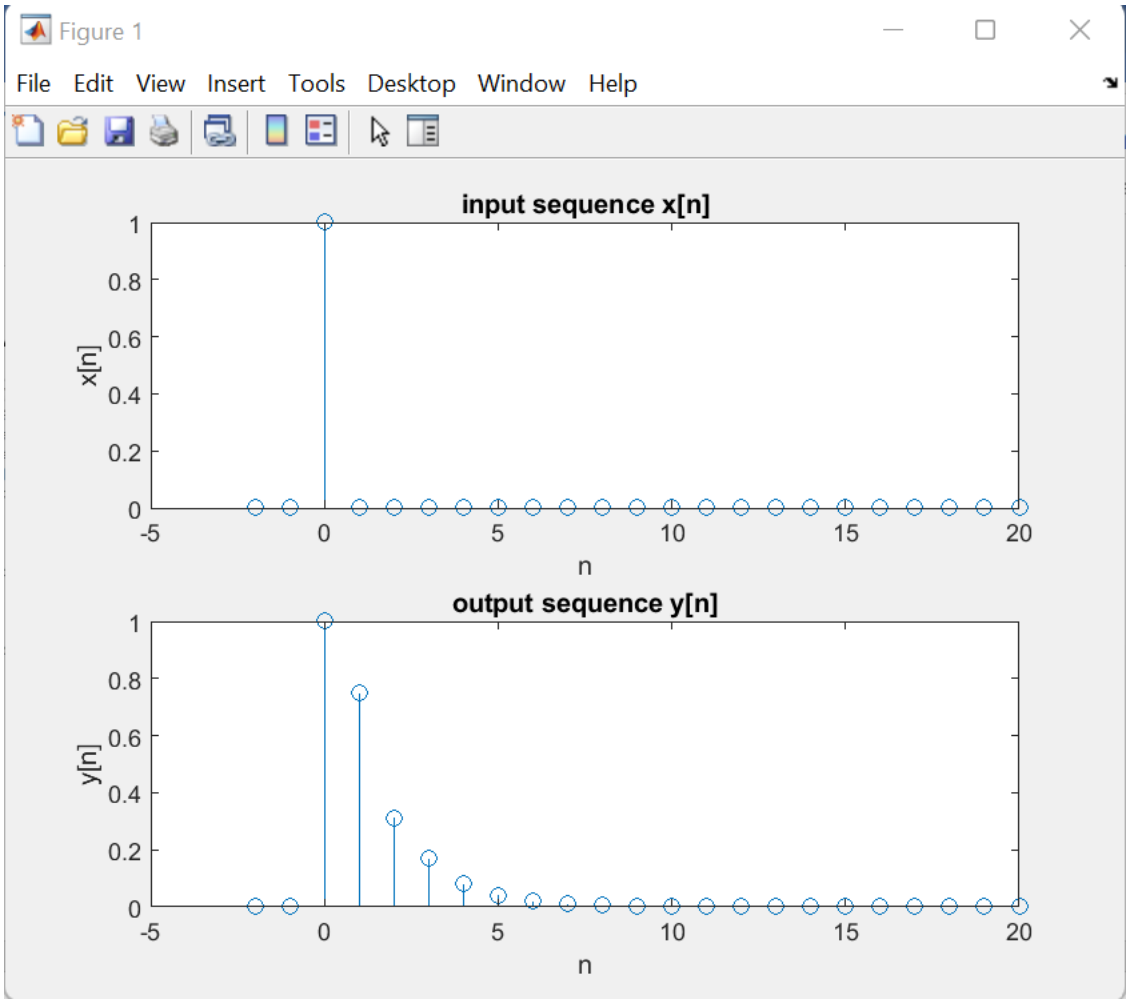
PROJECT1_IMPULSE

```
b=input('Enter the coefficients of x: ');
a=input('Enter the coefficients of y: ');

M=length(b)-1;
N=length(a)-1;

IC=[0 0];
n=[-N:20];%number of terms

%x[n]=u[n]-u[n-2]
x=double([n==0]);

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]');
xlabel('n');
ylabel('y[n]');
disp('y[n]=');
disp(y)
```

TERMINAL OUTPUT:

```
Command Window
  >> PROJECT1_IMPULSE
  Enter the coefficients of x: [1 0.5]
  Enter the coefficients of y: [1 -0.25 -0.125]
  y[n]=
    Columns 1 through 11

         0         0    1.0000    0.7500    0.3125    0.1719    0.0820    0.0420    0.0208    0.0104    0.0052

    Columns 12 through 22

      0.0026    0.0013    0.0007    0.0003    0.0002    0.0001    0.0000    0.0000    0.0000         0         0

    Column 23

         0

fx >>
```

PLOT:



CONCLUSION:

The Difference equation is solved using Matlab and the corresponding Impulse response is obtained.