Experiment No: 4 Date: 19/08/2024

CIRCULAR CONVOLUTION

Aim

To find the Circular Convolution using

1. Built-in function (circshift)
2. Concentric Circles

Theory

Circular convolution is a process used in signal processing to combine two periodic signals. Unlike linear convolution, where signals extend infinitely, circular convolution assumes that the signals wrap around, creating a continuous loop. This means that when the end of one signal meets the beginning of the other, they interact as if they were connected.

This approach is particularly useful for analyzing signals in systems where periodicity is important, such as in digital signal processing and communications. Circular convolution can be efficiently computed using the Fast Fourier Transform (FFT), allowing for rapid processing of data.

In practical applications, circular convolution helps in tasks like filtering, where the output signal is influenced by the entire input signal, taking into account the periodic nature of the data. Understanding circular convolution is essential for designing and analyzing systems that handle cyclical information, such as audio and image processing.

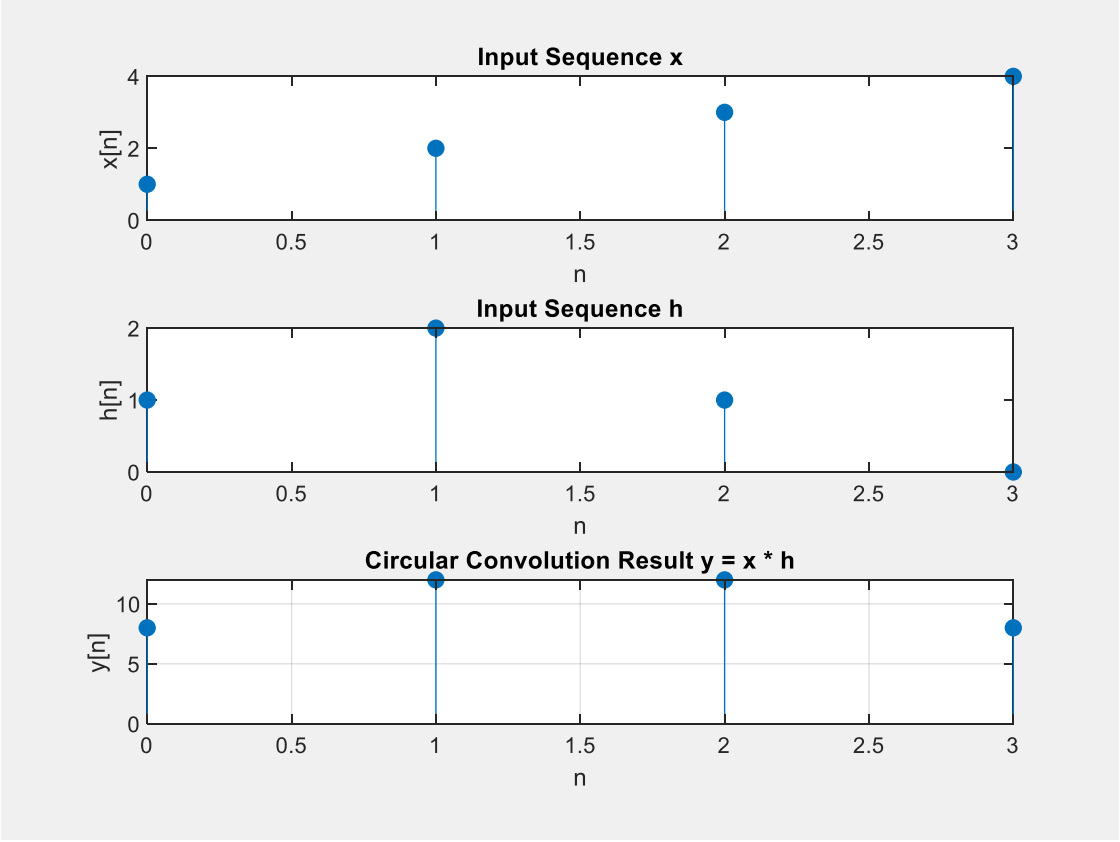
OBSERVATION

1. **INPUT=**

   x = [1 2 3 4]

   h = [1 2 1 0]

OUTPUT=



Program

1. To find Circular convolution using Built-in function (cicrshift)

```
clc;
clf;
close all;
clear all;
x = input('Enter x values=');
h = input('Enter h values=');
N = length(x);
y = zeros(1, N);
for n = 1:N
    y(n) = sum(x .* circshift(h, n-1));
end
disp('Circular Convolution Result:');
disp(y);
subplot(3, 1, 1);
stem(0:N-1, x, 'filled');
title('Input Sequence x');
xlabel('n');
ylabel('x[n]');
subplot(3, 1, 2);
stem(0:N-1, h, 'filled');
title('Input Sequence h');
xlabel('n');
ylabel('h[n]');
subplot(3, 1, 3);
stem(0:N-1, y, 'filled');
title('Circular Convolution Result y = x * h');
xlabel('n');
ylabel('y[n]');
grid on;
```

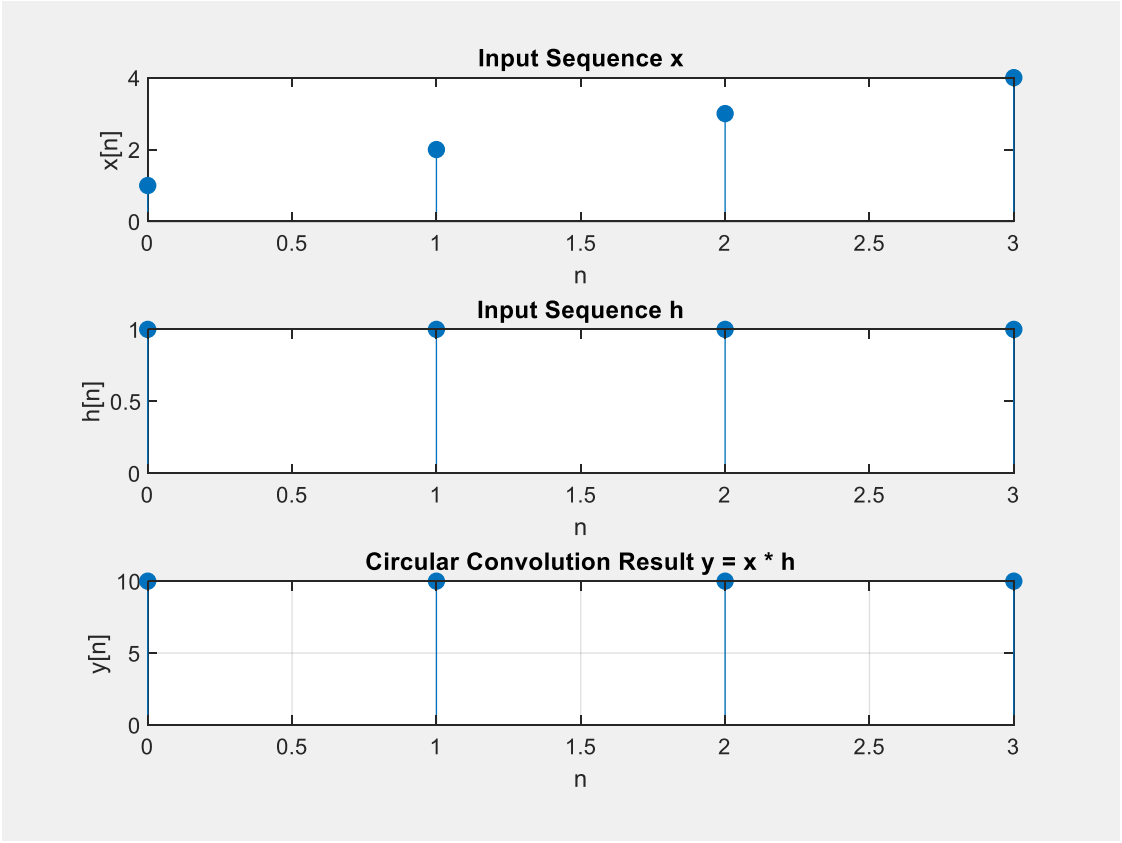
OBSERVATION

2. INPUT=

x = [1 2 3 4]

h = [1 1 1 1]

OUTPUT=



Program

2. To find Circular Convolution using Concentric circles

```
clc;
close all;
clear all;
x = input('Enter x values=');
h = input('Enter h values=');
N = max(length(x),length(h));
y = zeros(1,N);
for n=1:N
h_s = circshift(h,n-1); %shifting h(n) by 1 unit
y(n) = sum(x.*h_s);
end

disp("Using Concentric Circle Method:")
disp(y);
subplot(3, 1, 1);
stem(0:N-1, x, 'filled');
title('Input Sequence x');
xlabel('n');
ylabel('x[n]');
subplot(3, 1, 2);
stem(0:N-1, h, 'filled');
title('Input Sequence h');
xlabel('n');
ylabel('h[n]');
subplot(3, 1, 3);
stem(0:N-1, y, 'filled');
title('Circular Convolution Result y = x * h');
xlabel('n');
ylabel('y[n]');
grid on;
```

RESULT

Performed Circular Convolution using Built-in function and Concentric Circles Method and generated the plot.