Rajshahi University of Engineering and Technology

DEPT. of Electrical and Computer Engineering

Course No: ECE 4124

Course Title: Digital Signal Processing Sessional

Date of the submission:

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1. **Experiment No:** 02
2. **Experiment Date:** 03.05.2023

3. **Experiment Name**:
   a) Implementation of two signals using Circular Convolution.
   b) Plotting two given signal and calculating summation and subtraction of the signal.
   n1 = [0, 0, 0, 2, 2, 2, 1, 1, 1, 0, 2] and n2 = [2, 2, 0, 1, 1, 1, 0, 0, 0, 0, 3]
   c) Drawing the given signals in one figure.

4. **Theory:**

In the experiment, we worked with discrete signals. A discrete-time signal is a sequence of values of interest, where the integer index can be thought of as a time index, and the values in the sequence represent some physical quantity of interest.

Circular convolution, also known as cyclic convolution, is a special case of periodic convolution, which is the convolution of two periodic functions that have the same period. Circular convolution is defined for periodic sequences, whereas convolution is defined for aperiodic sequences. The circular convolution of two N-point periodic sequences x(n) and y(n) is the N-point sequence a(m) = x(n)* y(n), defined by.

5. **Required Software: MATLAB**

6. **Code with Output:**

a) Implementation of two signals using Circular Convolution:

```
clc;
close all;
clear all;
x = input('input X: ');
h = input('input H: ');
n1 = length(x)
n2 = length(h)
if(n1==n2)
    for i = 1:n1
        y(i)=0;
        for j=1:n2
            y(i)= y(i)+ h(i)*x(j)
        end
    end
else
    %print('Circular Convolution not possible.');
end
y
figure(1)
stem(y)
```

Output:

```
y =

    10    20    30    40
```

b) Plotting two given signal and calculating summation and subtraction of the signal:

```
clc;
close all;
clear all;

n1 = [0 0 0 2 2 2 1 1 1 0 2]
n2 = [2 2 0 1 1 1 0 0 0 0 3]

sum = n1+n2
sub = n1-n2
figure(2)
subplot(4,1,1)
stem(n1)
title('n1 signal')
subplot(4,1,2)
stem(n2)
title('n2 signal')
subplot(4,1,3)
stem(sum)
title('sum signal')
subplot(4,1,4)
stem(sub)
title('sub signal')
```

Output:

```
n1 =

     0     0     0     2     2     2     1     1     1     0     2


n2 =

     2     2     0     1     1     1     0     0     0     0     3


sum =

     2     2     0     3     3     3     1     1     1     0     5


sub =

    -2    -2     0     1     1     1     1     1     1     0    -1
```

c) Drawing the given signals in one figure:

```
clc;
clc;
close all;
clear all;
u=@(t) t>=0;
x=@(t) t.*u(t)-(t-1).*u(t-1)-(t-4).*u(t-4)+(t-5).*u(t-5);
t= linspace(-2,7,1000);
figure(3)
subplot(2,1,1)
plot(t,x(t))
```

```
title('n1 signal')
x=@(t) t.*u(t)-(t-1).*u(t-1)+(t-2).*u(t-2)-(t-3).*u(t-3)-
(t-4).*u(t-4)+(t-5).*u(t-5)-(t-6).*u(t-6)+(t-7).*u(t-7);
t= linspace(-2,9,1000);
subplot(2,1,2)
plot(t,x(t))
title('n2 signal')
```

7. Graphs:

a) Implementation of two signals using Circular Convolution:

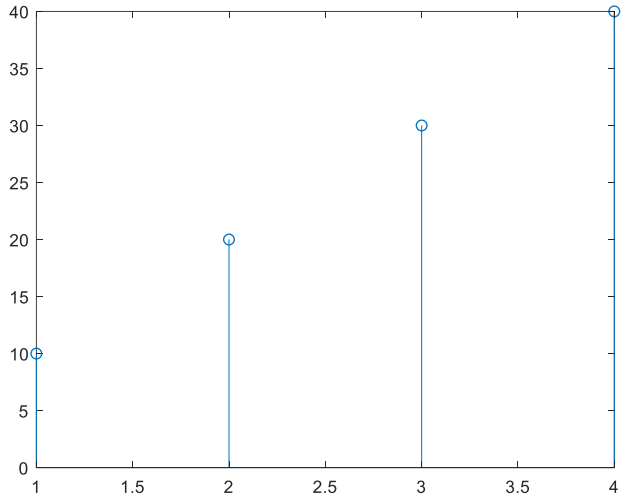
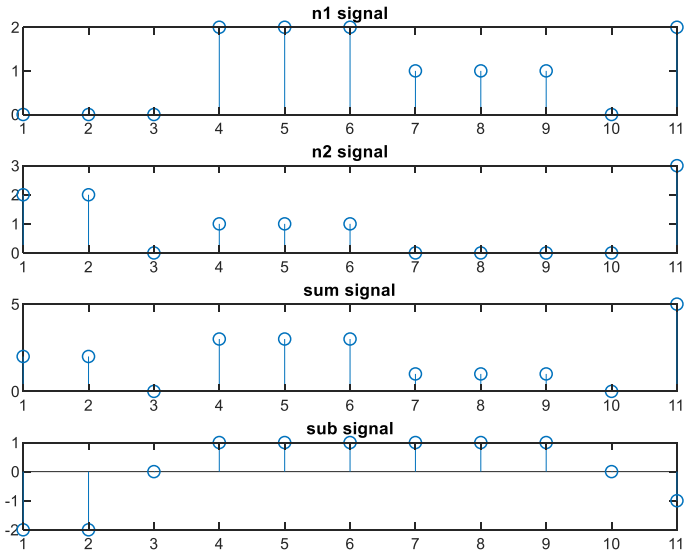
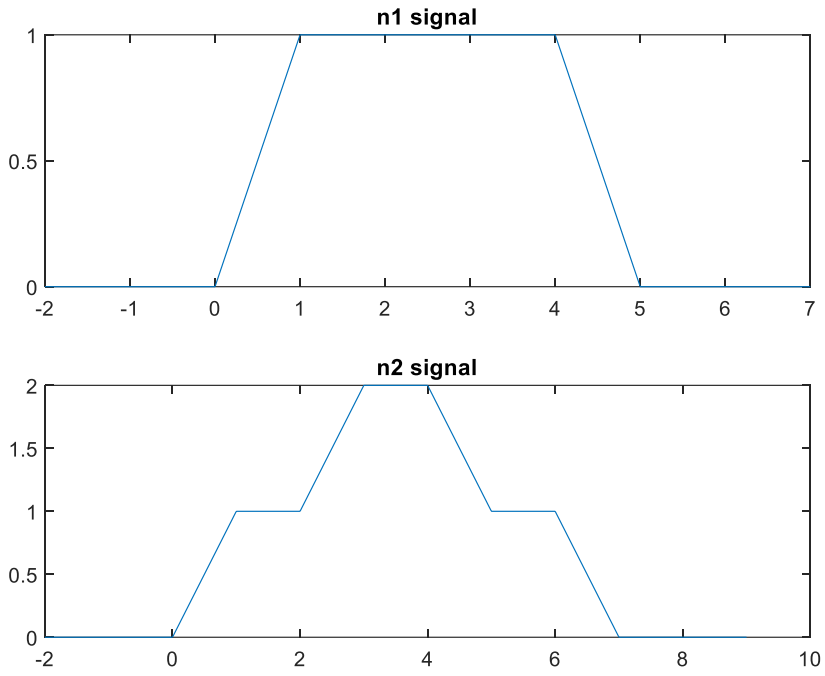


Fig.1.1 Circular Convolution of two signals

b) Plotting two given signal and calculating summation and subtraction of the signal:



c) Drawing the given signals in one figure:



8. Conclusion:

In the experiment, we have plotted all the signals correctly. So, we can say, the experiment is done successfully and the desired output is achieved.