Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology

Department of Electrical & Computer Engineering

Course No: ECE 4124

Course Title: Digital Signal Processing Sessional

Submitted By:	**Submitted To:**
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Experiment No: 02

Experiment Date: 03.05.2023

Experiment Name: Presentation and Convolution of signals using MATLAB

i) Study of circular convolution of two signals using MATLAB

ii) Plot two discrete signals, their addition and subtraction

iii) Figure drawing of two signals

Theory:

Circular convolution is a mathematical operation that is commonly used in digital signal processing. It is used to combine two signals in the time domain, and is often used to implement linear filtering operations. Unlike linear convolution, circular convolution is a periodic operation, meaning that the output signal repeats itself every N samples, where N is the length of the signals being convolved.

MATLAB is a powerful software tool for numerical computing, data analysis, and visualization. It is widely used in engineering, science, and other technical fields for a variety of applications, such as signal processing, control systems, image processing, and machine learning. MATLAB provides a user-friendly interface for programming and running numerical simulations, as well as a wide range of built-in functions and toolboxes for various applications.

Code:

i)

```
clc;
clear;
close all;
x=input('Enter the first array: ');
l1=length(x);
h=input('Enter the second array: ');
l2=length(h);
z=zeros(1,l1);
for i=1:l1
   for j=1:l1
       k=mod(i-j,l1)+1;
       z(i)=z(i)+x(j)*h(k);
   end
end
disp('Input Signals: ')
disp(x);
disp(h);
disp('Circular Convolution: ');
disp(z);
stem(z);
```

ii)

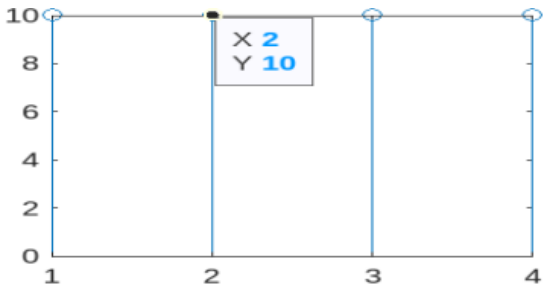
```
n1 = [0, 0, 0, 2, 2, 2, 1, 1, 1, 0, 2]
subplot(4, 1, 1);
stem(n1);
title('1st signal');
xlabel('Index');
ylabel('Value');
n2 = [2, 2, 0, 1, 1, 1, 0, 0, 0, 0, 3]
subplot(4, 1, 2);
stem(n2);
title('2nd signal');
xlabel('Index');
ylabel('Value');
n3=n1+n2;
subplot(4, 1, 3);
stem(n3);
title('Summation');
xlabel('Index');
ylabel('Value');
n4=n1-n2;
subplot(4, 1, 4);
stem(n4);
title('Subtraction');
xlabel('Index');
ylabel('Value');
```

iii)

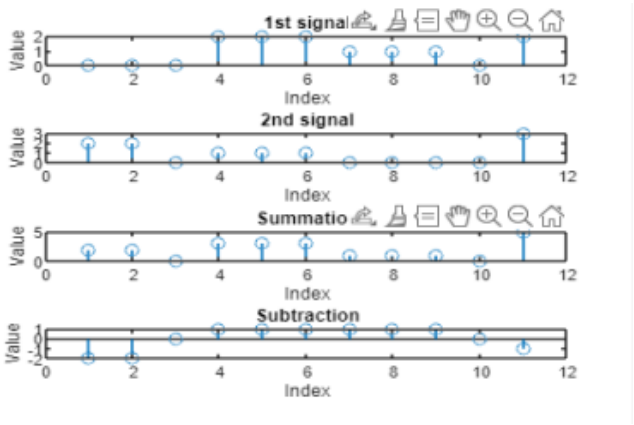
```
x=[0 0 1 1 1 1 0 0];
t=0:1:7;
subplot(2,1,1);
plot(t,x);
y=[0 1 1 2 2 1 1 0];
t=0:1:7;
subplot(2,1,2);
plot(t,y);
```

Output:

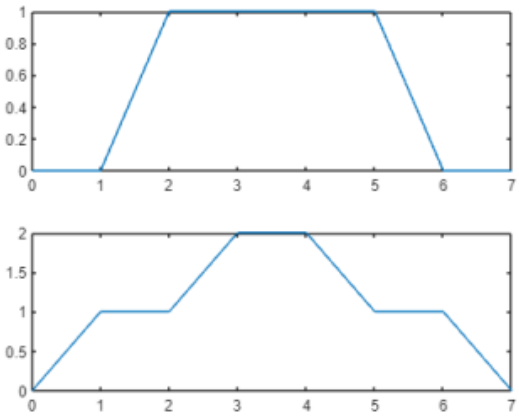
i)



ii)



iii)



Discussion & Conclusion:

Through the use of MATLAB, we were able to perform circular convolution of two signals and visualize the results. We saw how circular convolution can be used to efficiently compute the convolution of two signals and also completed the other experiments successfully.

In conclusion, the study of circular convolution of two signals using MATLAB has provided us with a deeper understanding of the mathematical principles underlying digital signal processing. And the experiment was done successfully.