Rajshahi University of Engineering& Technology

Department of Electrical & Computer Engineering

Course No: ECE 4124
Course Name: Digital Signal Processing Sessional

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Experiment No: 02

Experiment Date: 30.04.2023

Experiment Name: Calculation and representation of linear convolution using MATLAB.

Theory: Convolution is a type of math that blends two sounds together to make a new one. It's like using a strainer or a machine to change a starting signal into a different signal. It is a tool in computers that can do many different things, like making files smaller, analyzing medical signals, and working with pictures and sound.

Linear convolution is a math calculation that figures out what a Linear-Time Invariant (LTI) system will produce when you give it an input and impulse response. It works for both signals that change smoothly and signals that change in steps.

Linear Convolution can be shown as-

y at point n equals the multiplication of x at point n and h at point n.

This formula gives us the answer for something called "output". X(n) is what we put into the system, and H(n) is how the system responds.

Linear convolution can work even if the input and impulse response sequences are not the same size. This means they might have different amounts of things to test. Therefore, the result may have more or less samples than the original inputs.

Software used: MATLAB

Code:

```
x = [1 2 3 4 5];
y = [5 4 3 2 1] ;

L1=length(x);

L2= length(y);

N=L1+L2-1;

x=[x,zeros(1,N-1)];

y=[y,zeros(1,N-1)];

for n=1:N

    for k=1:n

        c(n)=c(n)+x(k)+y(n-k+1);

     end

end

disp('c= ')

disp(c);
```

Output:

```
^ | The Convulated Values :      5    14    26    40    55    40    26    14    5
  | >>
```
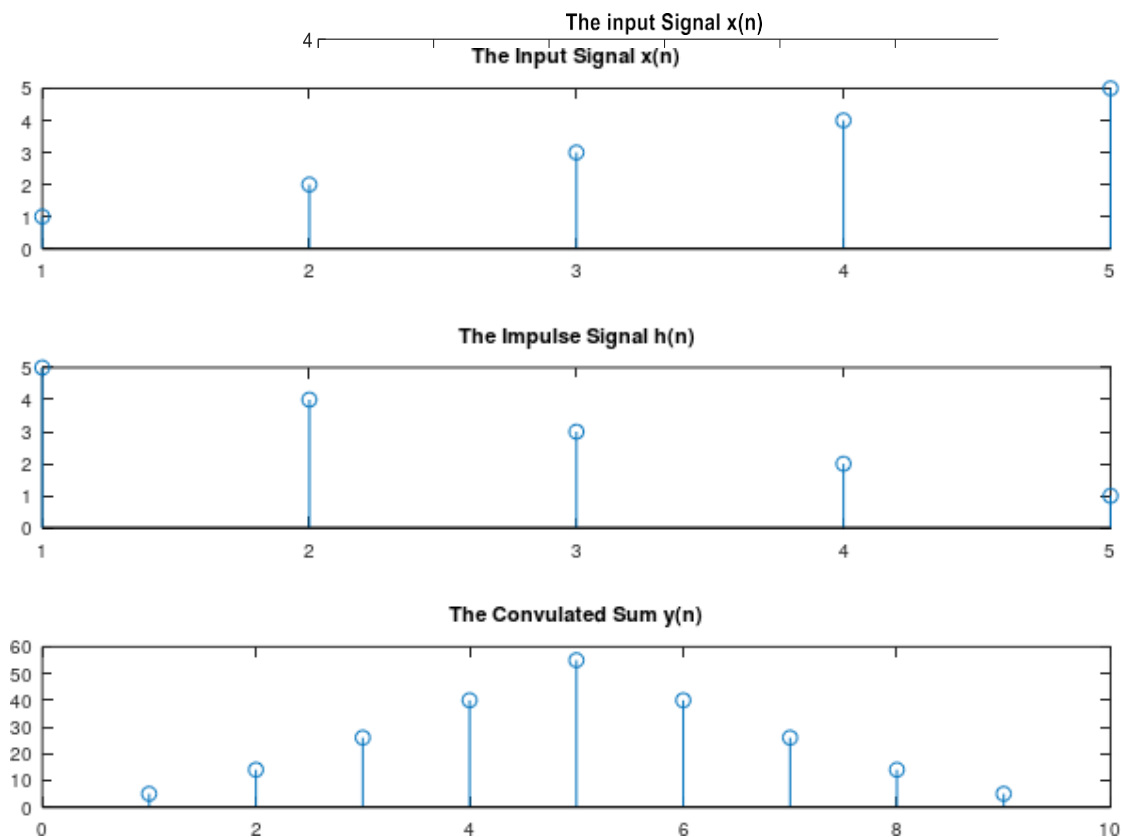
Fig. 1 Convoluted values of y(n)

Fig. 2 Linear Convoluted plot

Discussion: In the experiment, we combined two signals by multiplying them together and adding up the diagonal elements of the result. Next, we graphed the outcomes using a computer program called MATLAB.

Conclusion: The experiment worked well with no mistakes or problems in the code and graphs.