

**Experiment No:** 02

**Experiment Date:** 30.04.2023

**Experiment Name:** Study of linear convolution

**Theory:** A third function that represents the fusion of the two input functions is created by the mathematical procedure known as linear convolution, which takes two discrete functions as input. In signal processing, linear convolution is frequently used to combine two signals. This technique entails multiplying each sample of one signal by each sample of the other, then adding the results to create a new signal. Since the convolution method involves overlapping samples at the edges of the input signals, the output signal will have a length equal to the sum of the lengths of the input signals less one. Digital filtering, audio processing, picture processing, and other areas all make use of the fundamental signal processing procedure known as linear convolution.

**Required software:** MATLAB

**Code:**

```
1. clc
2. x = input('Enter the elements of function x within [ ] bracket\n');
3. L = length(x);
4. h = input('Enter the elements of function h within [ ] bracket\n'); 5. M =
   length(h);
6.
7. N = L + M -1;
8.
9.         for i=1:N
10.            y(i)=0;
11.            for j=1:L
12.                if ((i-j+1)>0 && (i-j)<4)
13.                    y(i)=y(i)+x(j)*h(i-j+1);
14.                    disp(y(i));
15.                end
16.            end
17.        end
18.        subplot(3,1,1);
19.        stem(x);
20.        title('Input Signal x(n)');
21.        subplot(3,1,2);
22.        stem(h);
23.        title('Impulse Response h(n)');
24.        subplot(3,1,3);
25.        stem(y);
26.        title('Convolution Result y(n)');
```

**Output:**

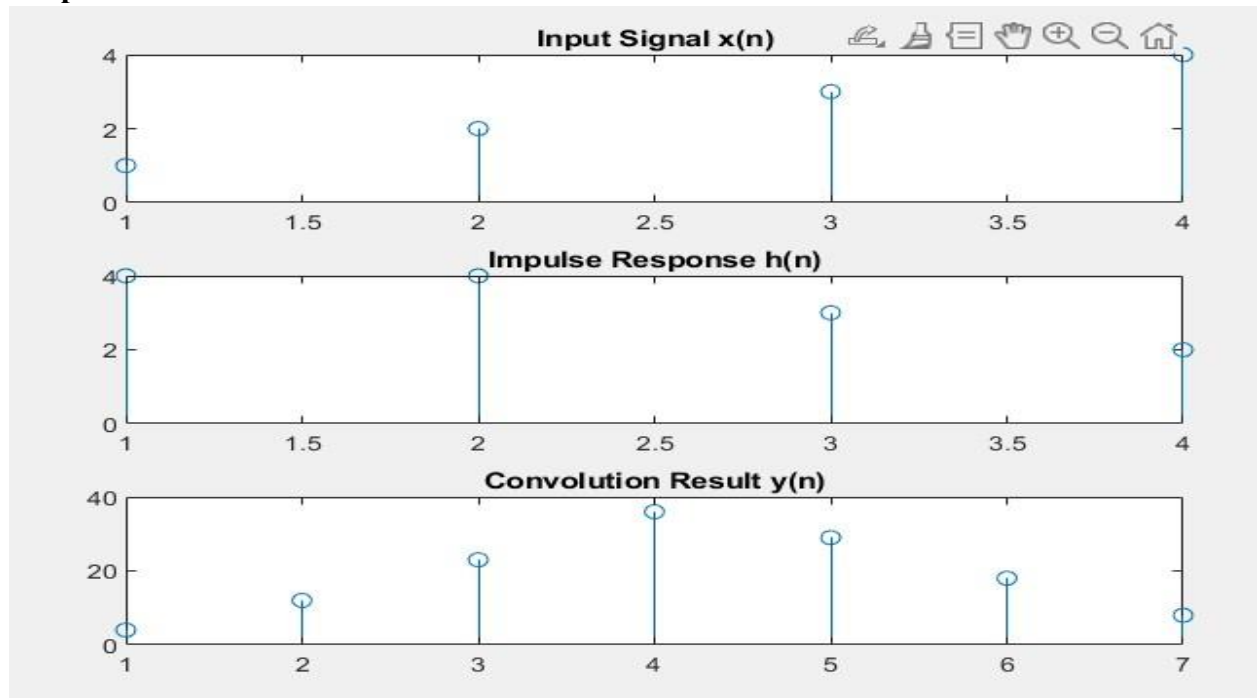


Figure 1: Linear Convolution Plot

**Discussion:** This experiment demonstrated how to create linear convolution in MATLAB for digital signal processing, which was done without the aid of the convolution function in MATLAB.

**Conclusion:** Algorithms produced exact output graphs in the experiment that matched the functions and theoretical arguments provided.