

**Heaven's Light is Our Guide**

## **Rajshahi University of Engineering & Technology**



**Course Code:** ECE 4124

**Course Title:** Digital Signal Processing Sessional

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**Experiment No: 01**

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**Experiment Name:** Study of Convolution of Two Signals using MATLAB

**Theory:**

The convolution of two signals is a mathematical operation that combines the two signals to produce a third signal that represents how one signal modifies the other as they are combined. It is a fundamental operation in signal processing, used for various applications such as filtering, feature extraction, image processing, and many more.

$$y(n) = \sum x(n) * h(n-k) \text{ for } k = -\infty \text{ to } +\infty$$

There are two types of convolutions:

i). Continuous convolution: Continuous convolution is used to describe the convolution of two continuous-time signal. It is defined as follows:

Given two continuous-time signal  $x(t)$  and  $h(t)$ , their continuous convolution  $y(t)$  is given by:

$$y(t) = x(t) * h(t)$$

ii). Discrete convolution: Discrete convolution is used to describe the convolution of two discrete-time signal. It is defined as follows:

$$y(n) = x(n) * h(n)$$

**Code:**

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

```
h = [ 4 4 3 2];
```

```
m=length(x);  
l=length(h);  
X=[x,zeros(1,l)];  
H=[h,zeros(1,m)];
```

```
z=[];  
for i=1:m  
    g=h.*x(i);  
    z=[z,g];  
end
```

```
[r c] = size(z);  
k = r+c;  
t =2;  
Y=[];  
cd =0;
```

```
while(t<=k)  
    for i=1:r  
        for j=1:c  
            if((i+j)==t)  
                cd = cd+ z(i,j);  
            end  
        end  
    end  
    t = t+1;  
    Y = [Y cd];  
    cd =0;  
end
```

```
subplot(3,1,1);  
stem(x);  
xlabel('n');  
ylabel('x');  
title('1st Signal');
```

```

subplot(3,1,2);
stem(h);
xlabel('n');
ylabel('h');
title('2nd Signal');

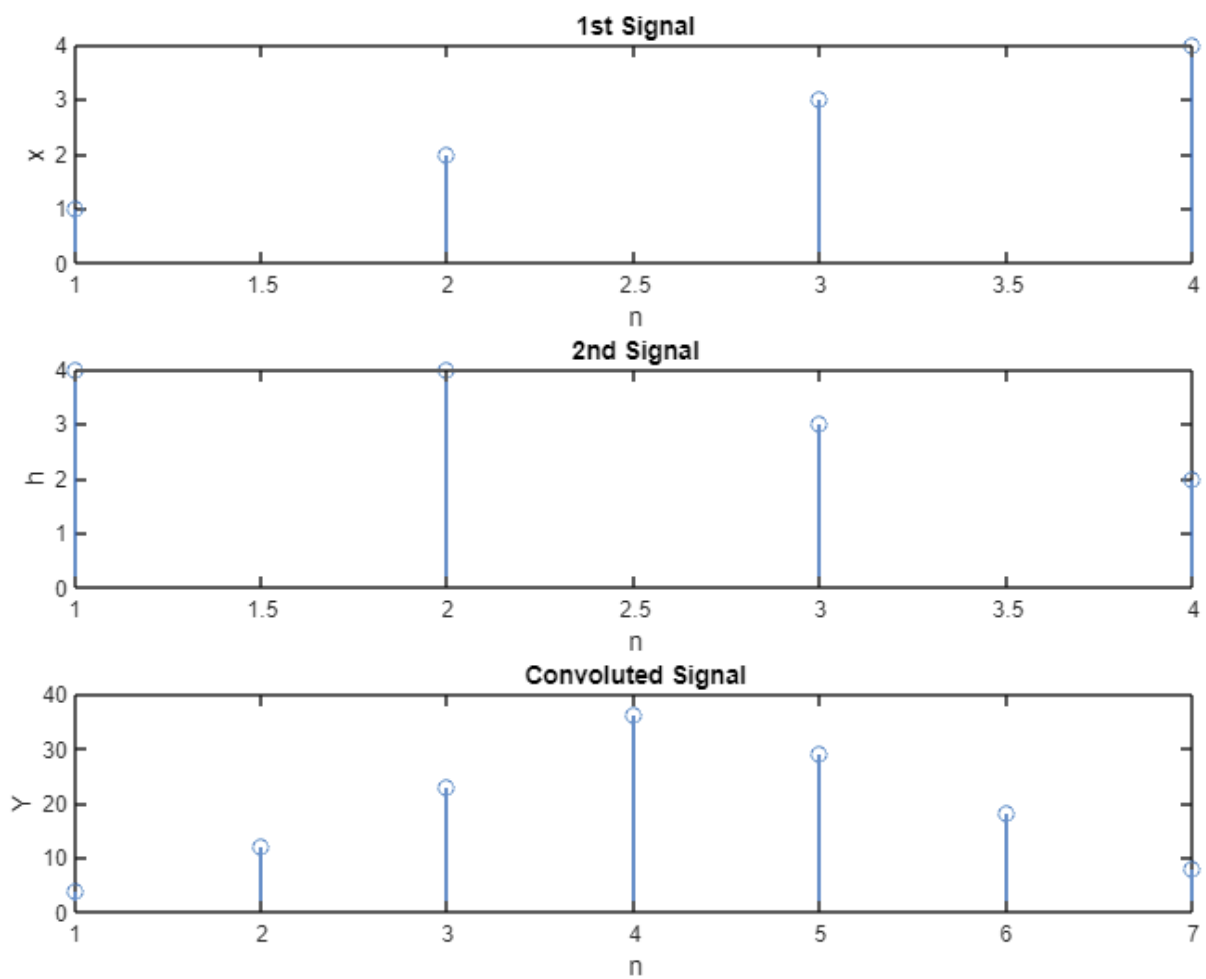
```

```

subplot(3,1,3);
stem(Y);
xlabel('n');
ylabel('Y');
title('Convolved Signal');

```

### Output:



**Discussion:**

Here, we convoluted two signals without using the `conv()` function. The `conv()` function was also used to check whether the previous output was similar or not. The obtained result was same in both the cases.

**Conclusion:** The experiment was carried out successfully.