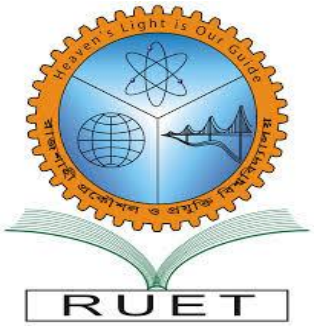

Rajshahi University of Engineering & Technology, Rajshahi

COURSE TITLE- Digital Signal Processing Sessional

COURSE NO- ECE 4124

18 SERIES

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Experiment No: 02

Experiment Name: Convolution for linear systems

Experiment Date: 30/04/23

Theory:

Convolution is a mathematical operation that combines two signals and outputs a third signal. If we have two functions, x(n) and y(n), convolution is an integral that expresses the amount of overlap of one function y as it is shifted over function x.

Convolution is two types. One is linear & another one is circular. Linear which is for aperiodic signal & Circular which is for periodic signal. In this lab we have learnt only linear system. The main application of this linear system are digital filter, data compression, biomedical signal processing, speech & image processing etc.

Here,

X(n) [Excitation]→ Y(n)→Z(n) [Response]

Required Software: MATLAB

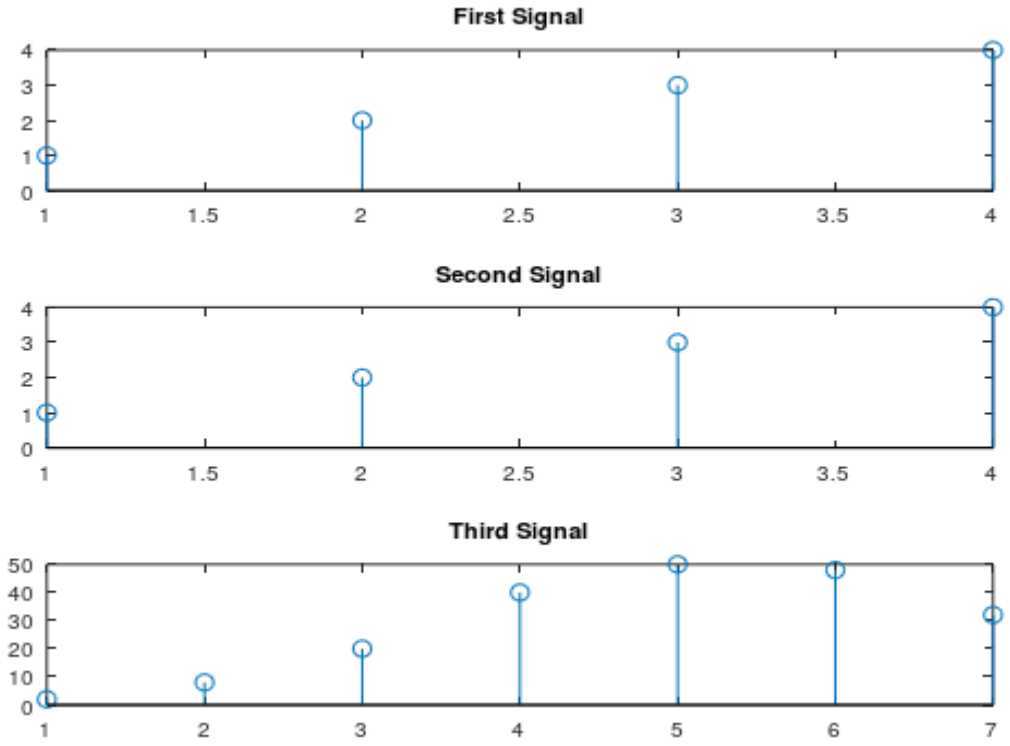
Code:

```
clc;
clear all;
close all;

x=[1,2,3,4];
y=[1,2,3,4];
z=zeros(1,length(x) + length(y)-1);

for i=1:length(z)
  for k=1:length(y)
    if i-k+1>0 && i-k+1 <= length(x)
      z(i) = z(i)+y(k)*x(i-k+1);
      z(i) = z(i)+y(k)*x(i-k+1);
    end
  end
 end
 subplot(3,1,1);
 stem(x);
 title('First Signal');
 subplot(3,1,2);
 stem(y);
 title('Second Signal');
 subplot(3,1,3);
 stem(z);
 title('Third Signal');
```

Output:



Discussion:

In this experiment I plotted convolution linear discrete signal. Here Matlab has a function called conv(x,y) that we can use to convolve two signals x(n) and y(n). It assumes that the time increment is the same for both signals. The input signals are finite-length, so the result of the convolution which have a length equal to the sum of the lengths of the inputs– which turns out to be length(x) + length(y) - 1. And after subplotting we got first signal , second signal & the third signal.

Conclusion: All the desired outputs were achieved successfully.