EXPERIMENT NO.2

AIM: Write a program to perform linear and circular convolution of two sequences.

APPARATUS: MATLAB software

THEORY: Linear Convolution is a mathematical operation, which takes two signals and produces a third signal. In linear systems, convolution is used to describe the relationship between the input signal, the impulse response, and the output signal. Convolution is the process by which one may compute the overlap of two graphs. In fact, convolution is also interpreted as the area shared by the two graphs over time. If the input and impulse response of a system are x[n] and h[n] respectively, the convolution is given by the expression,

$y[n] = x[n] * h[n] = \sum_{k=-\infty}^{k=\infty} . x[k]\, h[n-k]$

Circular convolution, also known as cyclic convolution is the convolution of two periodic functions that have the same period. Circular convolution is defined for periodic sequences, whereas convolution is defined for aperiodic sequences. The circular convolution of two *N*-point periodic sequences *x1*(*n*) and *x2*(*n*) is given by

$x_3[m] = x_1[n] * x_2[n] = \sum_{n=0}^{N-1} x_1[n]\, x_2[m-n,(\text{mod } N)]$ m = 0,1,2……N-1

PROGRAM FOR LINEAR CONVOLUTION:

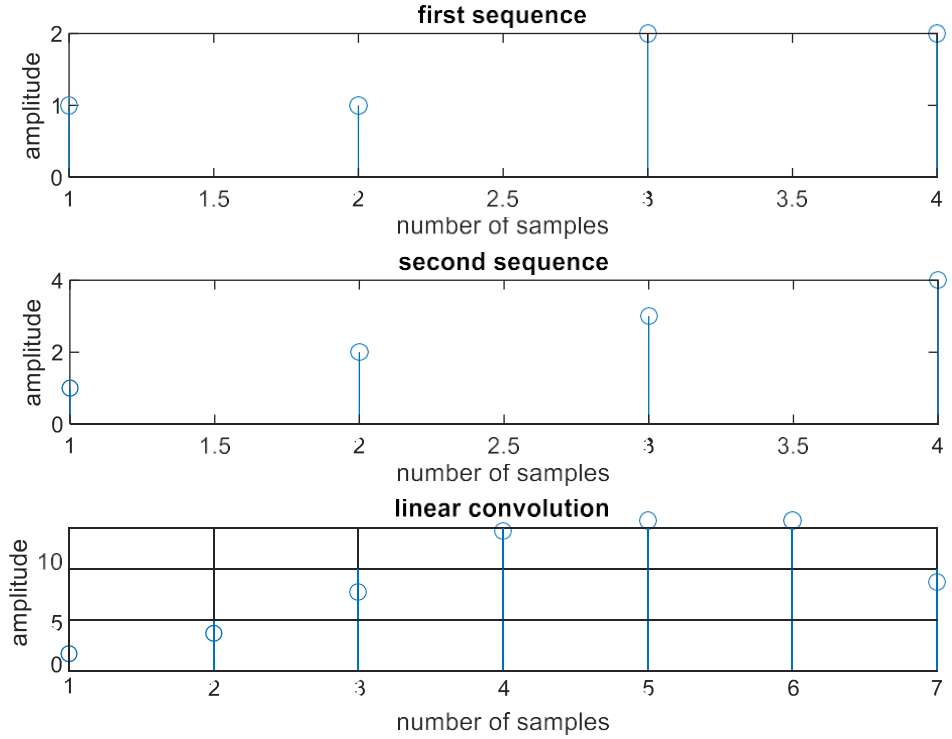
```
x = input("enter the first sequence");
subplot(3,1,1);
stem(x);
xlabel("number of samples");
ylabel("amplitude");
title("first sequence");
y = input("enter the second sequence");
subplot(3,1,2);
stem(y);
xlabel("number of samples");
ylabel("amplitude");
title("second sequence");
z = conv(x,y);
subplot(3,1,3);
stem(z);
xlabel("number of samples");
ylabel("amplitude");
title("linear convolution");
grid on;
disp("the resultant signal is z =");
disp(z)
```

OUTPUT:

enter the first sequence[1 1 2 2]

enter the second sequence[1 2 3 4]

the resultant signal is z = 1 3 7 13 14 14 8



PROGRAM FOR CIRCULAR CONVOLUTION:

```
x = input("enter the first sequence");
subplot(3,1,1);
stem(x);
xlabel("number of samples");
ylabel("amplitude");
title("first sequence");
y = input("enter the second sequence");
subplot(3,1,2);
stem(y);
xlabel("number of samples");
ylabel("amplitude");
title("second sequence");
l1 = length(x);
l2 = length(y);
N = max(l1,l2);
z = cconv(x,y,N);
subplot(3,1,3);
stem(z);
xlabel("number of samples");
```

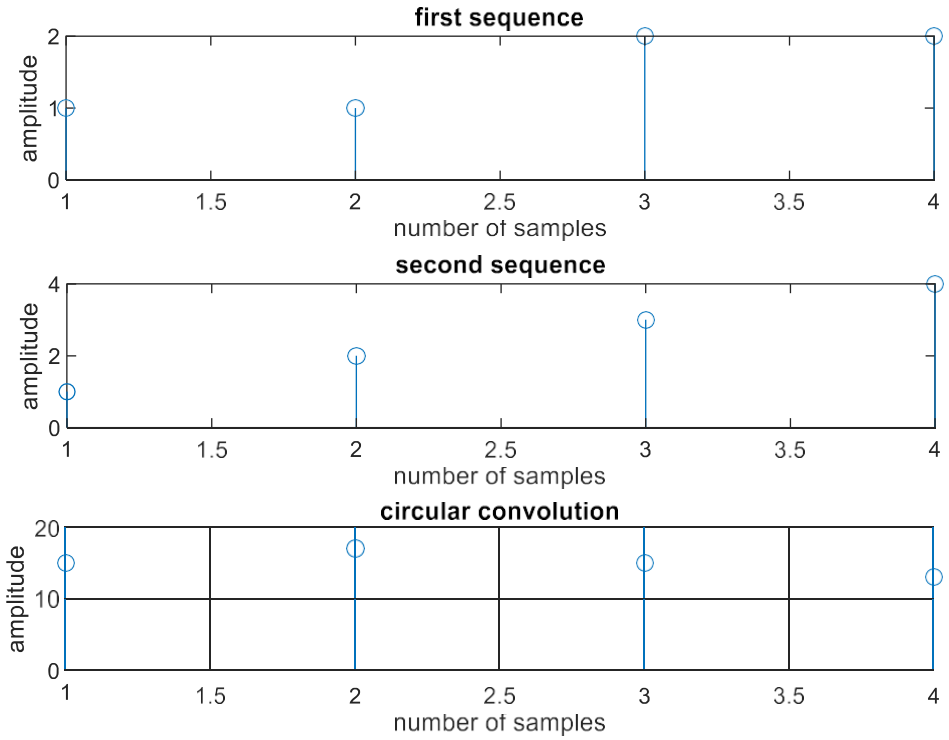
```
ylabel("amplitude");
title("circular convolution");
grid on;
disp("the resultant signal is z =");
disp(z)
```

OUTPUT:

enter the first sequence[1 1 2 2]

enter the second sequence[1 2 3 4]

the resultant signal is z = 15 17 15 13



POST LAB QUESTION:

Q1. Differentiate between linear convolution and circular convolution.

Q2. Calculate the linear convolution of the following sequence theoretically and verify it practically .

x(n) = [1,3,4,5] and h(n) = [2,1,3,6]