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Experiment 1	
AIM:	The aim of this experiment is to study mathematical operation such as : Linear Convolution, Circular Convolution, and Linear Convolution using Circular Convolution.
OBJECTIVE:	To Develop a function to find Linear Convolution and Circular Convolution To Calculate Linear convolution, Circular convolution, Linear Convolution using Circular Convolution and verify the results using mathematical formulation. To Conclude on aliasing effect in Circular convolution
PROBLEM DEFINITION:	1. Find Linear Convolution and Circular Convolution of L point sequence x[n] and M point sequence h[n]. 2. Find Linear Convolution of L point sequence x[n] and M point sequence h[n] using Circular convolution. 3. Give your conclusion about No of values in Linearly Convolved signal, Aliasing effect in Circular Convolution.
INPUT SPECIFICATIONS	1. Length of first Signal L and signal values. 2. Length of second Signal M and signal values.

EXPERIMENTATION AND RESULT ANALYSIS

CASE 1: To find y[n] = x[n] * h[n]

Input x[n] = { 5,6,7,8 } Length L= 4
h[n] = { 9, 10, 11 } Length M= 3

```
Enter the length of signal x: 4
Enter the length of signal h: 3
Enter the values of signal x:
x[0]: 5
x[1]: 6
x[2]: 7
x[3]: 8
Enter the values of signal h:
h[0]: 9
h[1]: 10
h[2]: 11
x[n]:
 [5.0, 6.0, 7.0, 8.0]
h[n]:
  [9.0, 10.0, 11.0]
Linear convolution result: [45.0, 104.0, 178.0, 208.0, 157.0, 88.0]
```

Result Analysis:

Length of Linear Convolution output signal is
N = 4+3-1 == 6
That means, Length of Linear Convolution
output signal is N = L + M –1

CASE 2: To find y[n] = x[n] ⊛ h[n]

Input x[n] = { 5,6,7,8 } Length L= 4
h[n] = { 9, 10, 11 } Length M= 3

```
Enter the length of signal x: 4
Enter the length of signal h: 3
Enter the values of signal x:
x[0]: 5
x[1]: 6
x[2]: 7
x[3]: 8
Enter the values of signal h:
h[0]: 9
h[1]: 10
h[2]: 11
Circular convolution result: [202.0, 192.0, 178.0, 208.0]
```

Result Analysis:

The first few values of Circular Convolution output signal are aliased with the values beyond N.
For ex. Let x[n] = { 5,6,7,8 } Length L = 4
h[n] = { 9, 10, 11 } Length M = 3
Then linear convolution output : Length N = 6
{45,104,178,208,157,88}
The circular convolution output : Length N = 4
{202,192,178,208}

CASE 3: To find y[n] = x[n] * h[n]

Input x[n] = { 5,6,7,8 } Length L= 4
h[n] = { 9, 10, 11 } Length M= 3

```
x[n]: 5 6 7 8
h[n]: 9 10 11

Linear convolution using circular convolution is:   [ 45. 104. 178. 208. 157.  88.]
```

Result Analysis:

We must select a value N >= L + M - 1 and use L = N and M = N with L values in signal x being its initial values and N - L being 0's. Similarly, for the signal y. Using this, we get the linear convolution of signals using the circular convolution technique.

CONCLUSION:

1. Length of Linear Convolution output signal is N = L + M -1
   - Where L is the length of first input signal
   - M is the length of second input signal
   - N is the length of linear convolution output signal.
2. In Linear convolution if both the input signals are causal, then resultant output signal is also causal
3. To find Circular Convolution Select N = MAX(L,M)
   Where L is the length of first input signal
   M is the length of second input signal
4. To find Linear Convolution using Circular Convolution
   Select N >= L + M -1
   Where L is the length of first input signal and
   M is the length of second input signal.
5. Circular Convolution gives aliased output