Linear Convolution using Circular Convolution and vice versa

Aim

To find the linear convolution using circular convolution and vice versa of two input sequences

Theory

If we have two sequences $x_1(n)$ and $x_2(n)$ withy length L and M respectively, the resultant linear convolution has got L+M = 1, On the Other hand, if we're performing circular convolution, the resultant will have a length of max of L,M.

Program

➔ Linear Convolution using Circular Convolution

```
%Linear convolution using circular convolution

clc;
clear;
close all;
x=[1,2,3,4];
y=[1,1,1];
xl=length(x);
yl=length(y);
zl=(xl+yl)-1;
xn=[x zeros(1,zl-xl)];
yn=[y zeros(1,zl-yl)];
xa=fft(xn);
ya=fft(yn);
con=xa.*ya;
anss=ifft(con);
disp(anss);
answ=conv(x,y);
disp(answ);
```

➔ Circular Convolution using Linear Convolution

```matlab
% Circular convolution using linear convolution
clc;
clear;
close all;
x = [1, 2, 3, 4];
h = [1, 1, 1];
y=conv(x,h);
z=max(length(x), length(h));
r = [y(1:z)];
new = [y(z+1:length(y)) zeros(1, length(y)-z)];
for k = 1:z-1
    r(k)=r(k)+new(k);
end
disp(r);
```

Result

Executed Linear Convolution using Circular Convolution and Vice Versa

Observation

➔ Linear Convolution using Circular Convolution

| 1 | 3 | 6 | 9 | 7 | 4 |

| 1 | 3 | 6 | 9 | 7 | 4 |

➔ Circular Convolution using Linear Convolution

| 8 | 7 | 6 | 9 |