Experiment 10 : To find DFT & IDFT of given DT signals using FFT

Aim : To write the matlab code to determine DFT/IDFT of a given signal.

Run #01:

(1) Find the circular convolution for the given DT signals using matlab.

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

Write Matlab code using Matlab built-in functions fft & ifft.

```
>> x = [2 1 2 1];
>> h = [1 2 3 4];
>> cconv(x,h,4)

ans =

   14    16    14    16
```

OR

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

ccirc = ifft(fft(x).*fft(y))

ccirc =

   14    16    14    16
```

Run#02

(2)

Write you own program/code to find the DFT of the given discrete time signal x(n) =[1,2,3,4] and compare output of DFT with inbuilt FFT function. The expression for DFT is given below

$$X(k)=\sum_{n=0}^{N-1} x(n)e^{-i\frac{2\pi}{N}kn}$$

(Hint: use for loop)

```
N = 4;
x = [1 2 3 4];
X = zeros(N,1);
for k = 1:N
    X(k) = 0;
    for n = 1:N
        X(k) = X(k)+(x(n)*exp((-1j)*2*pi*(n-1)*(k-1)/N));
    end
end

disp(X);

%Calculating using DFT using the fft command
fft(x)
```

Ans:

With the manually written code:

10.0000 + 0.0000i

-2.0000 + 2.0000i

-2.0000 - 0.0000i

-2.0000 - 2.0000i

With the fft command

ans =

10.0000 + 0.0000i -2.0000 + 2.0000i -2.0000 + 0.0000i -2.0000 - 2.0000i

Run#03:

(3) Show that equivalence between linear and circular convolution for the given sequences :

x[n] = [6, 4, 3, 7, 8] and h[n] = [1, 2, 3, 4]

Use the “conv” command for linear convolution and “cconv” (or) FFT command for circular convolution.

Plot both the signals using stem function and compare the results obtained.

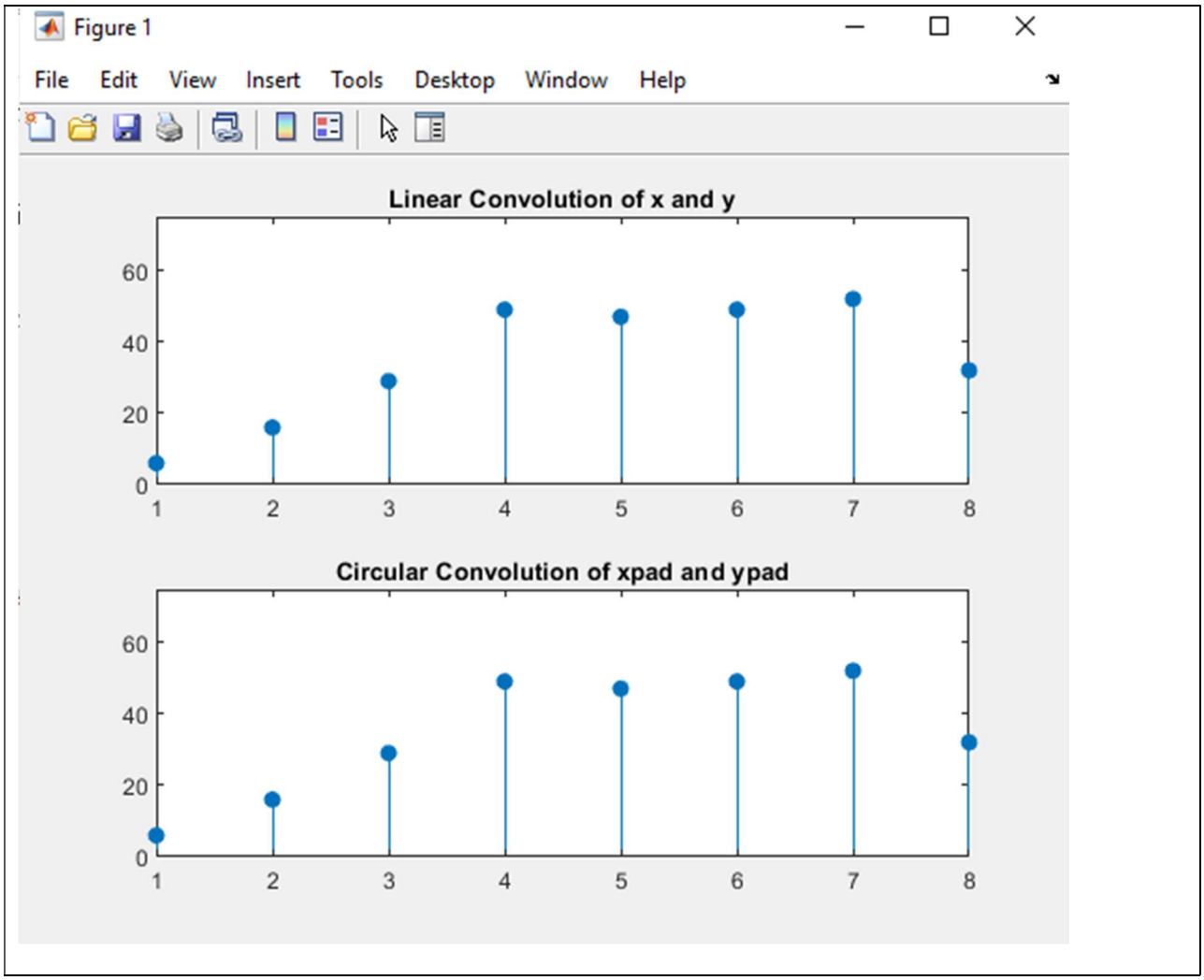
Ans:

```
x = [6 4 3 7 8];
y = [1 2 3 4];
clin = conv(x,y);

xpad = [x zeros(1,8-length(x))];
ypad = [y zeros(1,8-length(y))];
ccirc = ifft(fft(xpad).*fft(ypad));

subplot(2,1,1)
stem(clin,'filled')
ylim([0 75])
title('Linear Convolution of x and y')

subplot(2,1,2)
stem(ccirc,'filled')
ylim([0 75])
title('Circular Convolution of xpad and ypad')
```



Last Date of Submission : 15-04-2021(Thursday)

Both Tuesday and Thrusday lab section students submit your reports in this google link https://forms.gle/8w78LHHarTHR9uwe9