भारतीय प्रौद्योगिकी संस्थान तिरुपति

TIRUPATI

LAB SHEET 04

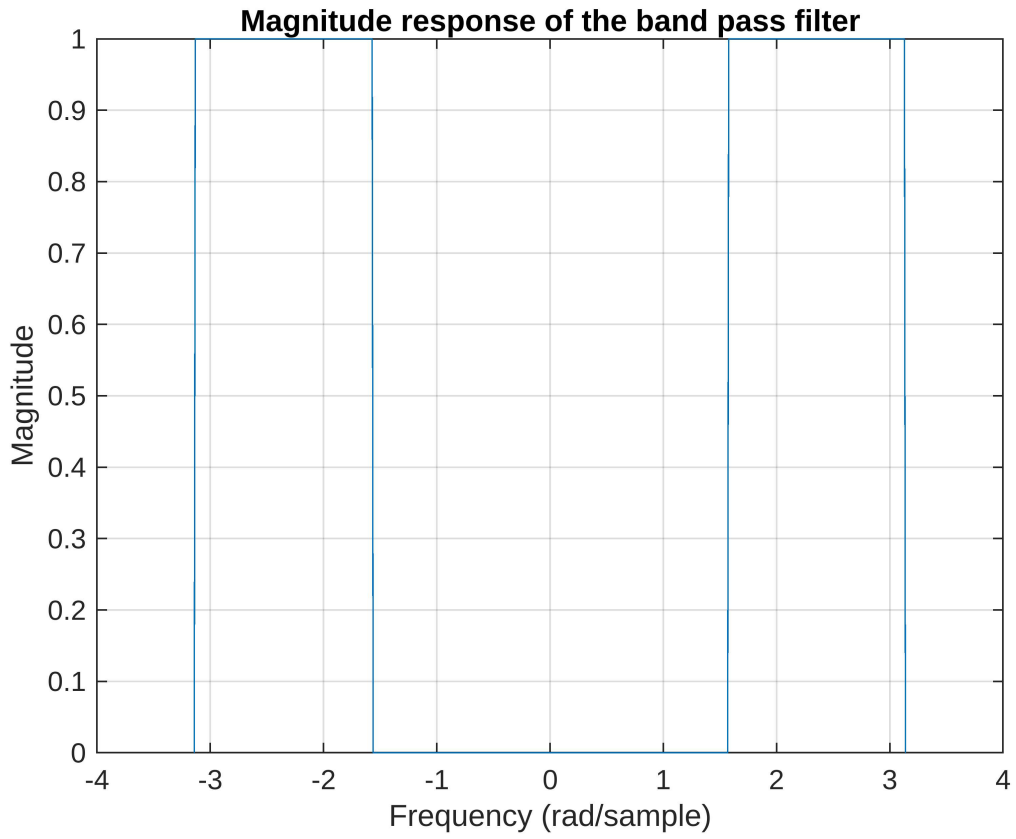
NAME : MADHU SAI NAIK P

ROLL NO : EE23B039

A. MAKING BAND PASS FILTER.

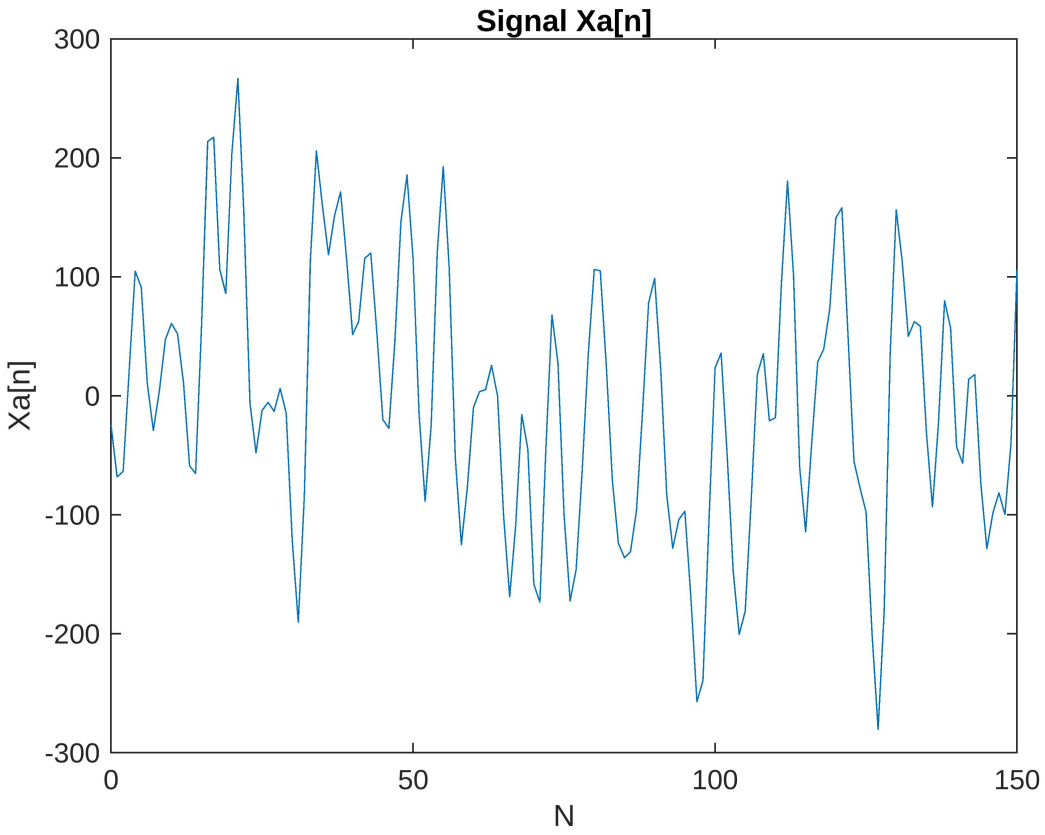
```
w = -pi:0.01:pi;
%MAKING AND LOW PASS FILTER
w1 = pi/2;
H1(length(w)) = 0;
H1(abs(w)<w1) = 1;
% MAKING AND HIGH PASS FILTER
w2 = pi/4;
H2(length(w)) = 0;
H2(abs(w)<w2) = 1;
% MAKING A BAND PASS FILTER
H = H1 - H2;

plot(w,abs(H));
xlabel('Frequency (rad/sample)');
ylabel('Magnitude');
title('Magnitude response of the band pass filter');
grid on;
```

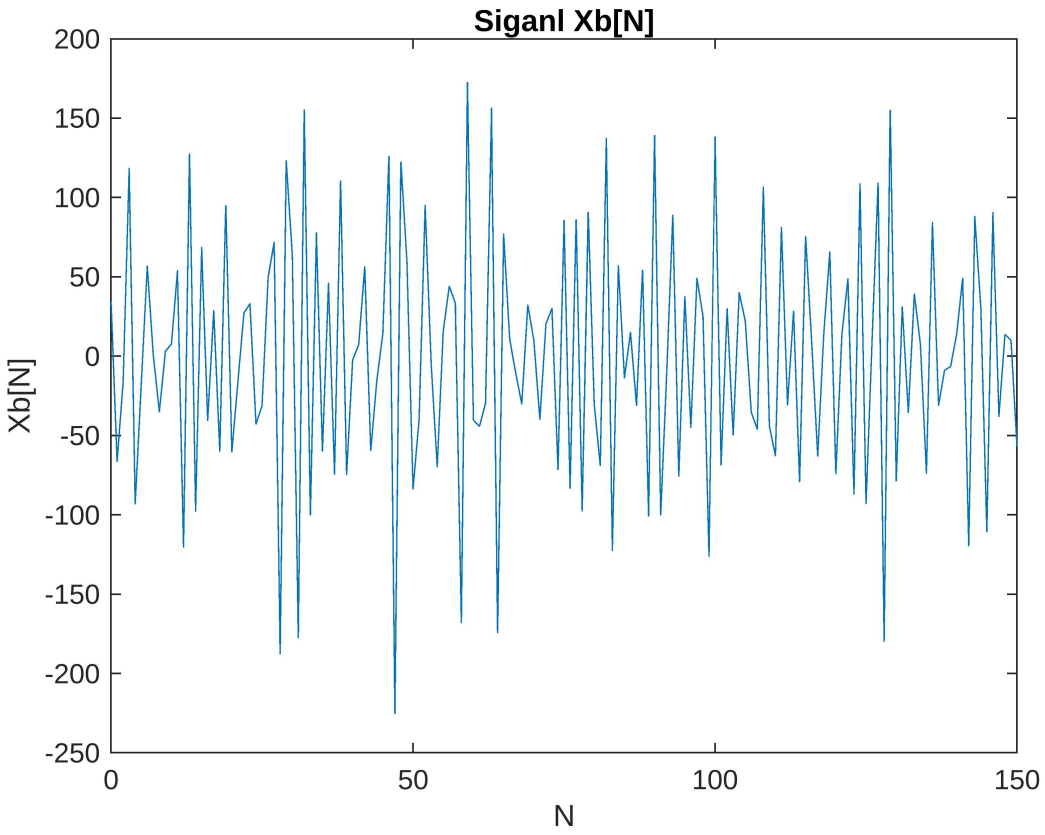


B. MAKING AN RANDOM X[N] SIGNAL.

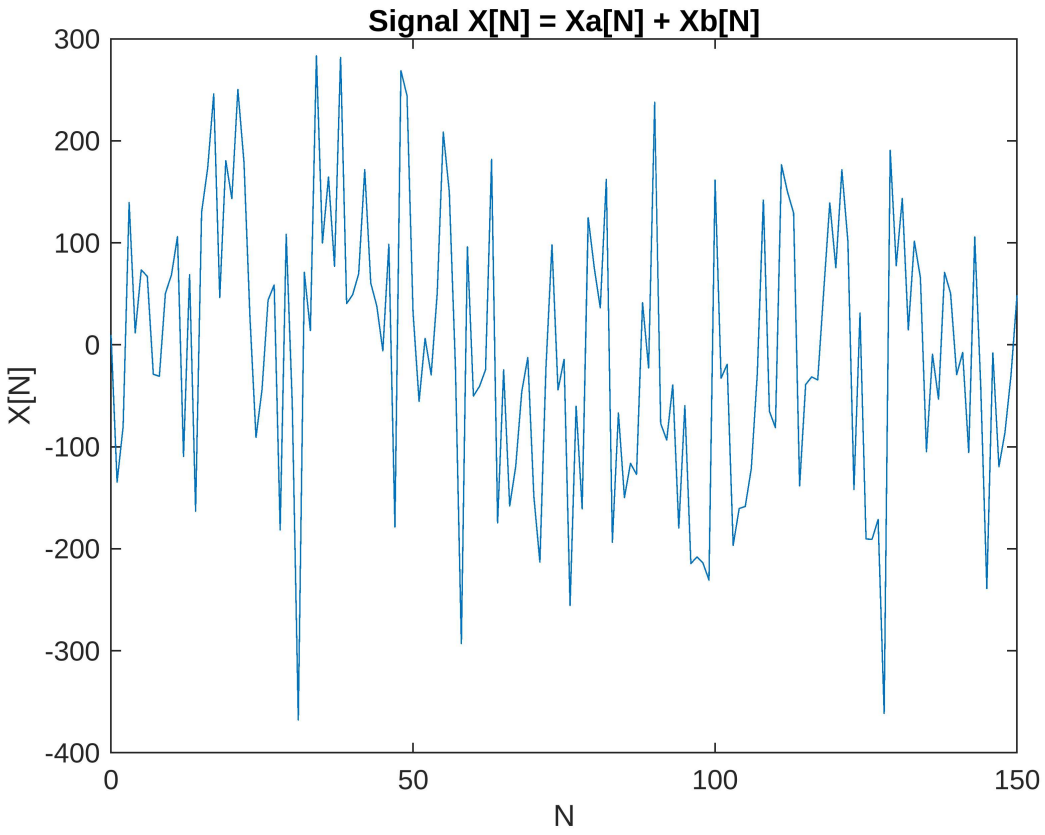
```
W = 0+pi.*rand();
L1 = 69;
Wl = W * rand(1,L1);
A = 30;
Al = 1+(A-1) * rand(1,L1);
phi = -pi+(2*pi)*rand(1,L1);
N = 200;
n = 0:150;
Xa_n = 0;
for l = 1:L1
    Xa_n = Xa_n + Al(l).*cos(Wl(l)*n+phi(l));
end
plot(n,Xa_n);
xlabel("N");
ylabel("Xa[n]");
title("Signal Xa[n]");
```




```
L2 = 35;
Wk =   rand(1, L2) * (pi - W) + W;
Ak = 1+(A-1) * rand(1,L2);
phiK = rand(1, L2) * 2 * pi - pi ;
Xb_n = 0;
for l = 1:L2
    Xb_n = Xb_n + Ak(l).*cos(Wk(l).*n+phiK(l));
end
plot(n,Xb_n);
xlabel("N");
ylabel("Xb[N]");
title("Siganl Xb[N]");
```

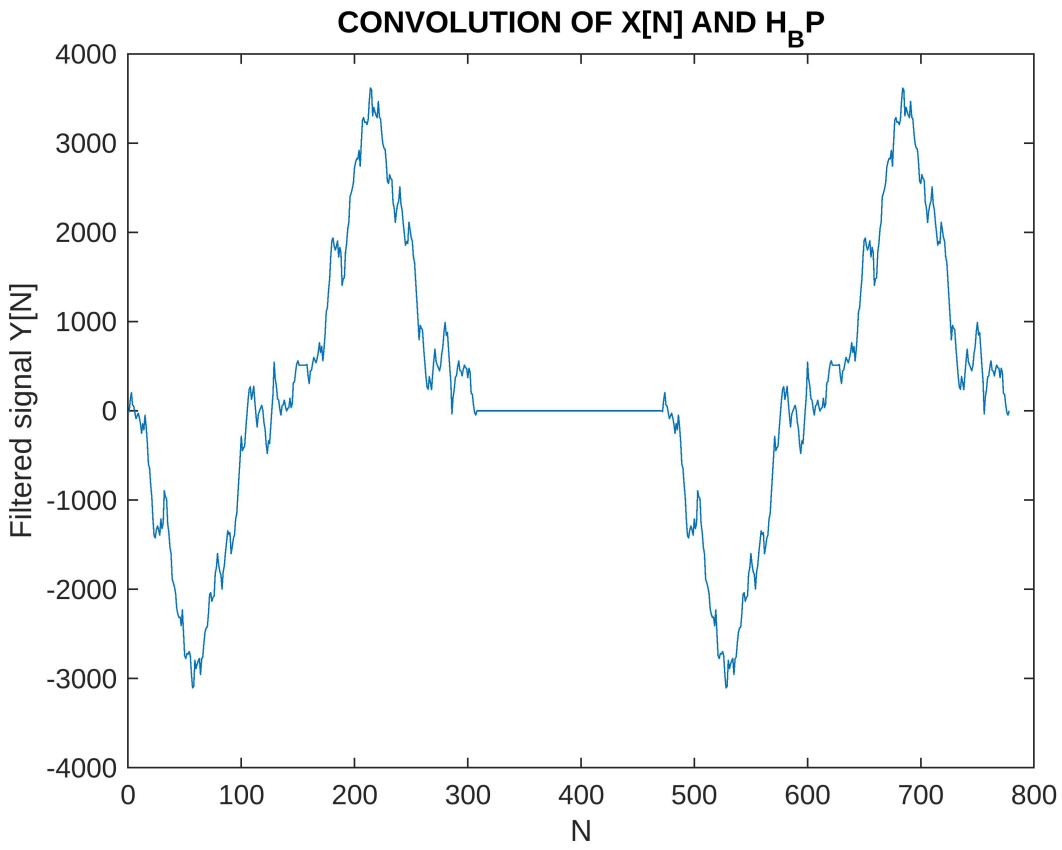



```
X_n = Xa_n + Xb_n;
plot(n,X_n);
xlabel("N");
ylabel("X[N]");
title("Signal X[N] = Xa[N] + Xb[N]");
```



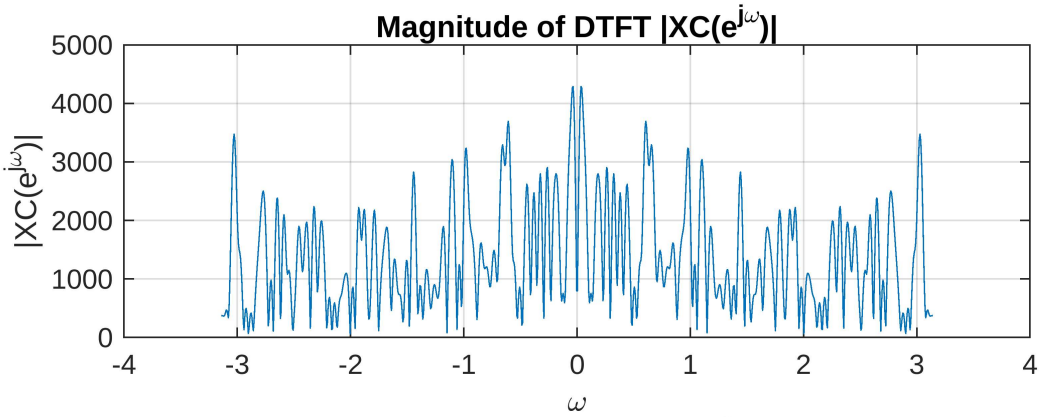
C. FILTERING THE X[N] SIGNAL.

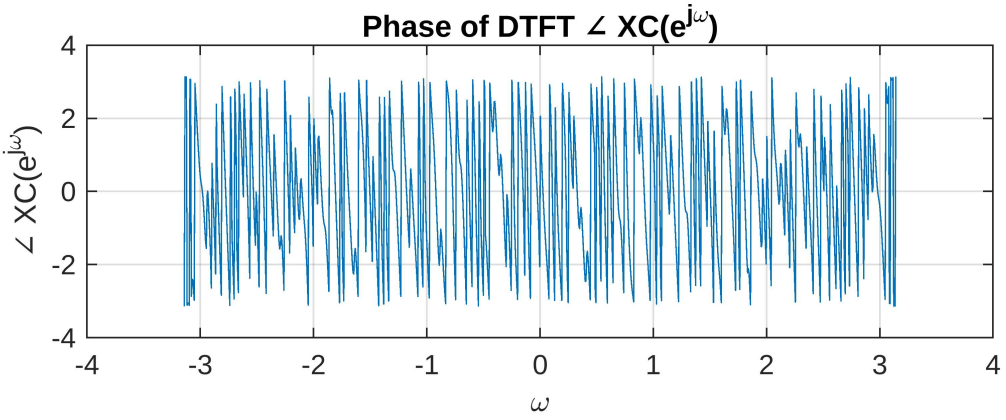
```
Y(length(w)) = 0;
Y = conv(X_n,H);
n = 0:1:778;
plot(n,Y);
xlabel('N');
ylabel('Filtered signal Y[N]');
title('CONVOLUTION OF X[N] AND H_BP');
```



D. FINDING DTFT TO SHOW THE FILTERING.

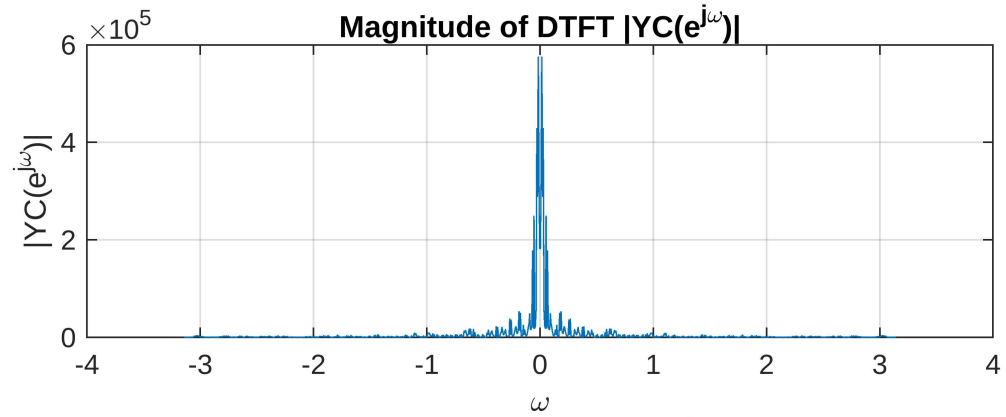
```
n=0:length(X_n)-1;
w = linspace(-pi, pi, 1000);
x = X_n;
X_h = zeros(1, length(w));
for k = 1:length(w)
    X_h(k) = sum(x .* exp(-1j * w(k) * n));
end
figure;
subplot(2, 1, 1);
plot(w, abs(X_h));
title('Magnitude of DTFT |XC(e^{j\omega})|');
xlabel('\omega');
ylabel('|XC(e^{j\omega})|');
grid on;
subplot(2, 1, 2);
plot(w, angle(X_h));
title('Phase of DTFT \angle XC(e^{j\omega})');
xlabel('\omega');
ylabel('\angle XC(e^{j\omega})');
grid on;
```

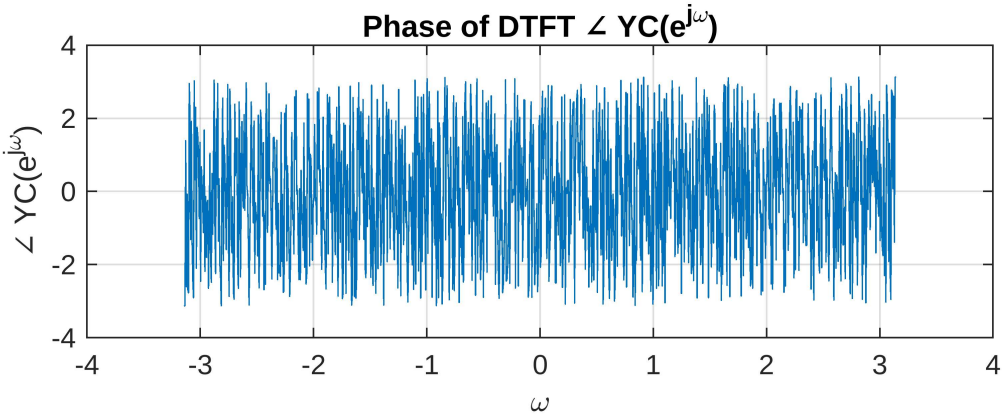





```
n=0:length(Y)-1;
w = linspace(-pi, pi, 1000);
x = Y;
Y_h = zeros(1, length(w));
for k = 1:length(w)
    Y_h(k) = sum(x .* exp(-1j * w(k) * n));
end

figure;
subplot(2, 1, 1);
plot(w, abs(Y_h));
title('Magnitude of DTFT |YC(e^{j\omega})|');
xlabel('\omega');
ylabel('|YC(e^{j\omega})|');
grid on;
subplot(2, 1, 2);
plot(w, angle(Y_h));
title('Phase of DTFT \angle YC(e^{j\omega})');
xlabel('\omega');
ylabel('\angle YC(e^{j\omega})');
grid on;
```


Magnitude of DTFT |YC(e^jω)|
×10^5
6
4
2
0
|YC(e^jω)|
-4
-3
-2
-1
0
1
2
3
4
ω


Phase of DTFT ∠ YC(e^jω)
4
2
0
-2
-4
∠ YC(e^jω)
-4
-3
-2
-1
0
1
2
3
4
ω