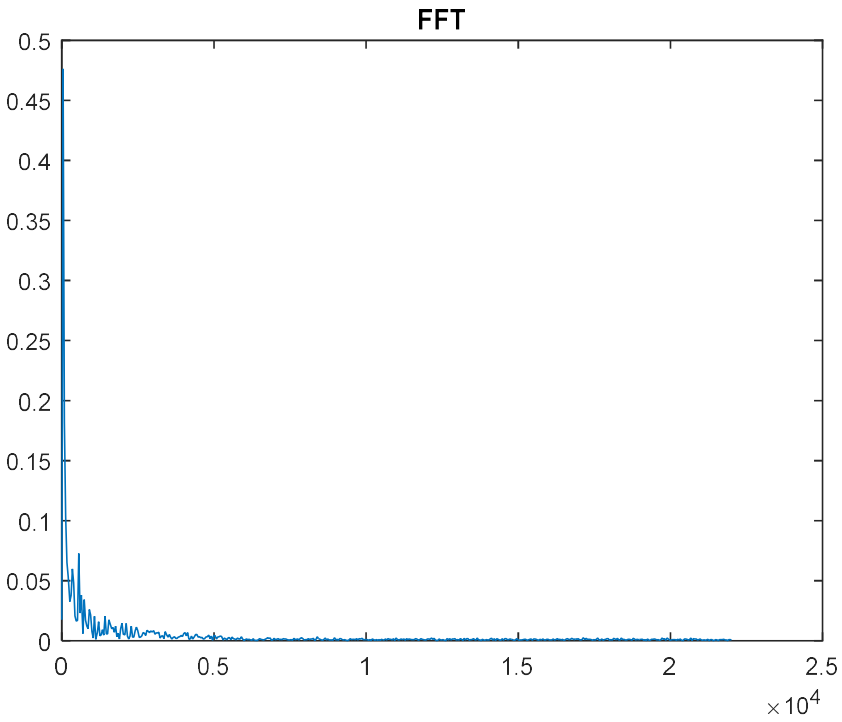
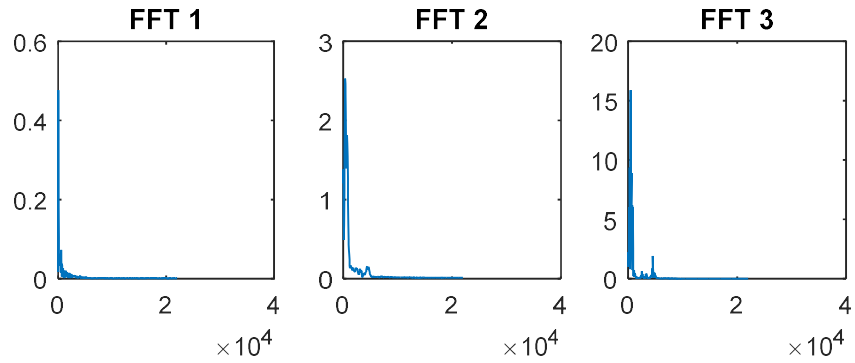
Labsheet 3

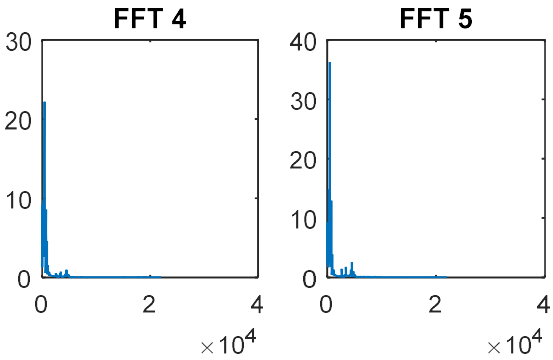
Q1.

```
figure(1);
[Y,fs]=audioread('speech.wav');
sound(Y,fs);
N=1024;
k=0:(N-1);
fx=fft(Y,N);
f=k*(fs/N);
plot(f(1:512),abs(fx(1:512)));
title('FFT');

ns=0.03*fs;%no of samples in 30ms
%getting the segments
A1=Y(1:ns);
A2=Y(ns:2*ns);
A3=Y(2*ns:3*ns);
A4=Y(3*ns:4*ns);
A5=Y(4*ns:5*ns);
%
fx1=fft(A1,N);
figure(2);
subplot(2,3,1);
plot(f(1:512),abs(fx1(1:512)));
title('FFT 1'); %freq=5168

fx2=fft(A2,N);
subplot(2,3,2);
plot(f(1:512),abs(fx2(1:512)));
title('FFT 2'); %freq=5599

fx3=fft(A3,N);
subplot(2,3,3);
plot(f(1:512),abs(fx3(1:512)));
title('FFT 3');%freq=5469

fx4=fft(A4,N);
subplot(2,3,4);
plot(f(1:512),abs(fx4(1:512)));
title('FFT 4');%freq=4910

fx5=fft(A5,N);
subplot(2,3,5);
plot(f(1:512),abs(fx5(1:512)));
title('FFT 5');%freq=5125

SumFreq=[5168 5599 5469 4910 5125];
Avg= mean(SumFreq)
```

```
Avg =  5.2542e+03
```

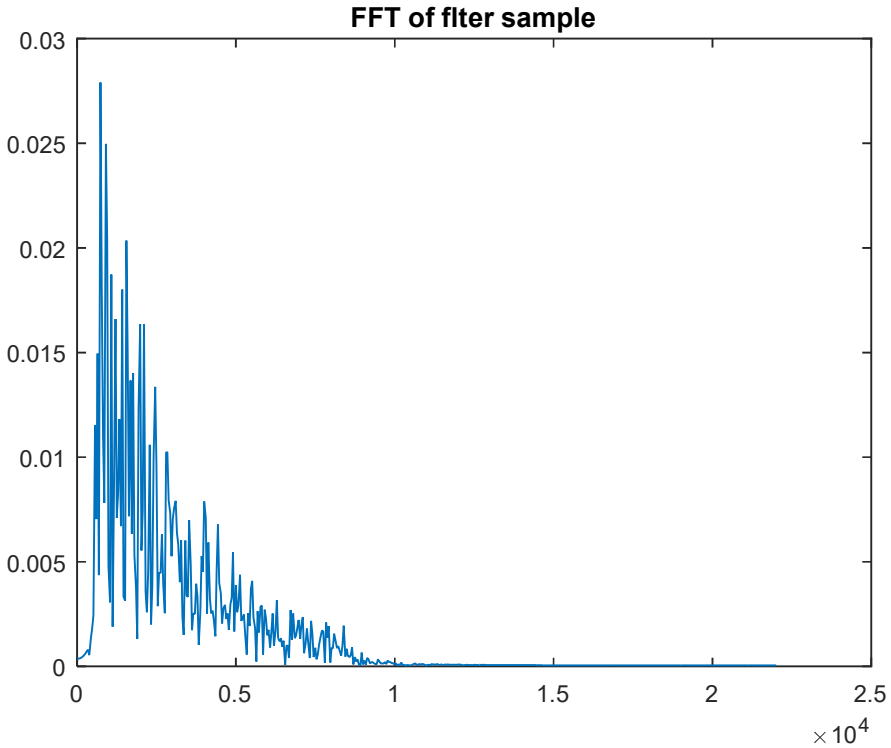






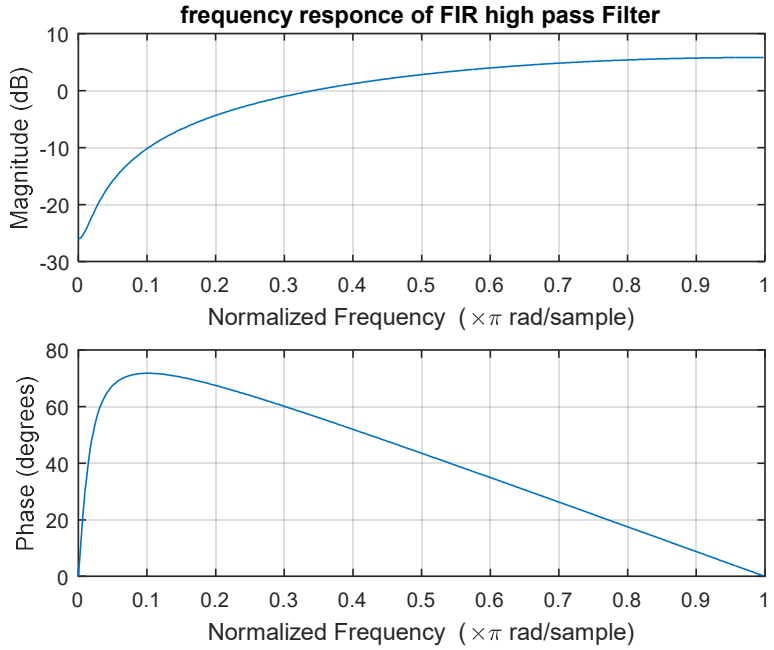
Q2. Noise and DC removal

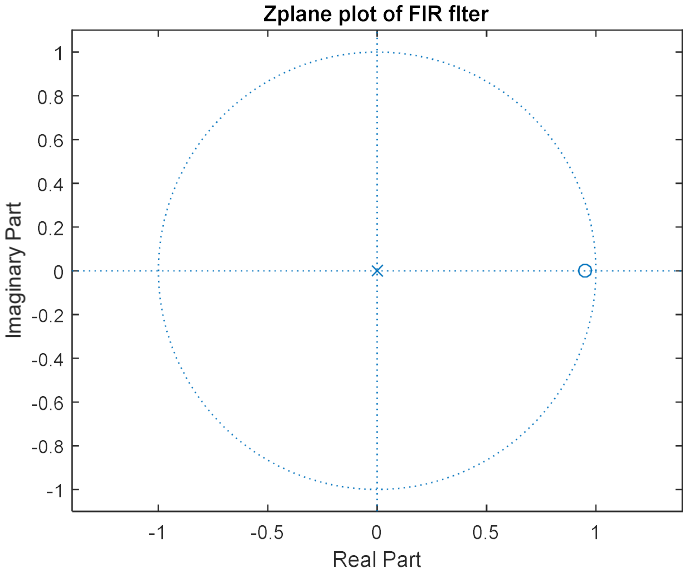
```
Clc
clear
figure(3);
[Y,fs]=audioread('speech.wav');
n=7;
Ny=fs/2;
begf=700/Ny;
finf=8000/Ny;
[b,a]=butter(n,[begf
finf],'bandpass');
X=filter(b,a,Y);
sound(X,fs);
N=1024;
k=0:(N-1);
fx=fft(X,N);
f=k*(fs/N);
plot(f(1:512),abs(fx(1:512)));
title('FFT of flter sample');
```

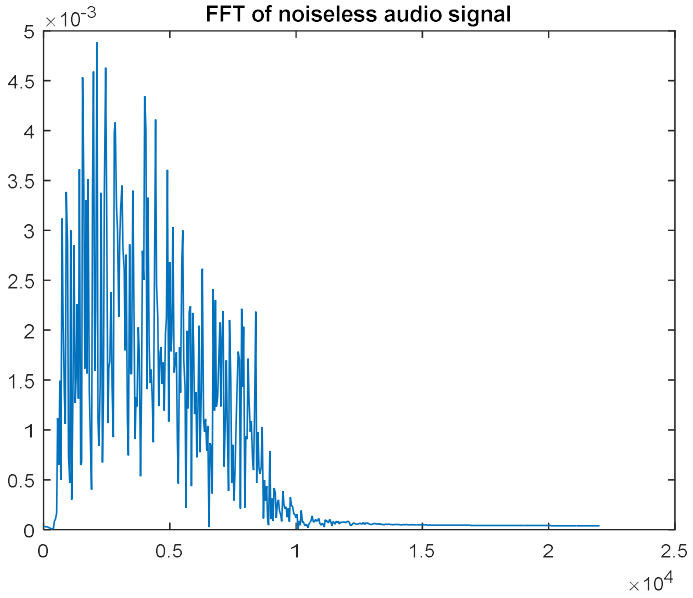


Q3. Pre-emphasis filtering:

```
clc
clear

%removing Noise
[Y,fs]=audioread('speech.wav');

n=7;
Ny=fs/2;
begf=700/Ny;
finf=8000/Ny;
[b,a]=butter(n,[begf
finf],'bandpass');
X1=filter(b,a,Y);


A=1;% coefficient of Y
B=[1 -.95];% coefficient of X
figure(1);
freqz(B,A)%the freq resp of the
filter
title('frequency responce of FIR high pass Filter');
figure(2);
zplane(B,A);%pole and zero plot of system

X2=filter(B,A,X1);
sound(X2,fs);
N=1024;
k=0:(N-1);
fx=fft(X2,N);
f=k*(fs/N);
figure(3);
plot(f(1:512),abs(fx(1:512)));
title('FFT');
```







Assignment:

```
%consider an array of umbers from 1-20, segment this array to array with 5 elements and
overlap of 3
clc
clear
clear
a=1:20;
n=5;
off=3;
v=1;
ln=length(a);
t=floor(ln/(n-off));
for i=1:t
    for j=1:n
        if v<=ln
        x(i,j)=a(v);
        v=v+1;
        else
         x(i,j)=0;
        end
    end
    v=v-off;
end
x
```

```
x =

     1     2     3     4     5
     3     4     5     6     7
     5     6     7     8     9
     7     8     9    10    11
     9    10    11    12    13
    11    12    13    14    15
    13    14    15    16    17
    15    16    17    18    19
    17    18    19    20     0
    18    19    20     0     0
```

Q. Find the Energy plot of the audio file:

```
clc
clear
clear
[a,fs]=audioread('sky.wav');
n=0.03*fs;
off=0.01*fs;
v=1;
ln=length(a);
t=floor(ln/(n-off));
%segmenting
for i=1:t
    for j=1:n
        if v<=ln
        x(i,j)=a(v);
        v=v+1;
        else
         x(i,j)=0;
        end
    end
```

```
    v=v-off;
end

%generating hamming window
h=hamming(n);

%multipling with hamming window
for i=1:t
    for j=1:n
        z(i,j)=x(i,j)*h(j);
    end
end

%fnding energy
E=zeros(1,t);
for i=1:t
    for j=1:n
        E(i)=E(i)+(z(i,j))^2;
    end
end
%ploting the waveform vs energy of the signal
subplot(2,1,1);
plot(a);
title('orginal waveform');
subplot(2,1,2);
num=1:t;
stem(num,E);
title('energy of wavefrorm');
```