

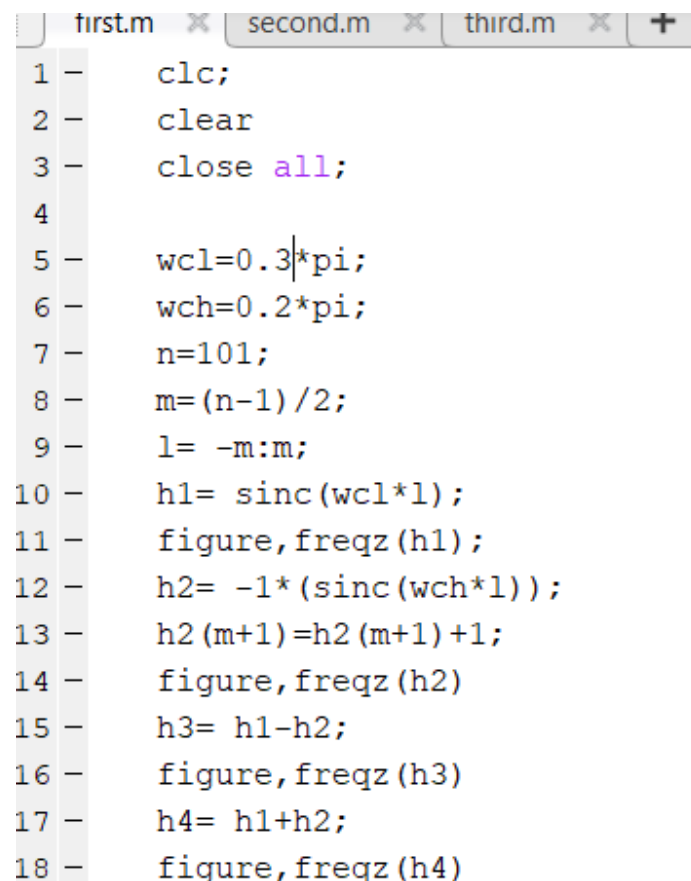
**Objectives:-** The objectives of the experiment are given below:-

1. Low pass, High Pass, Bandpass and Bandstop Filter Design.
2. Passing a voice signal through lowpass, highpass, bandpass and bandstop filter.
3. Adding Noise with Original Voice record and removing it by moving average method.

**Required Equipments:-** MATLAB SOFTWARE 2018a

**Problem-1:- Low pass, High Pass, Bandpass and Bandstop Filter Design**

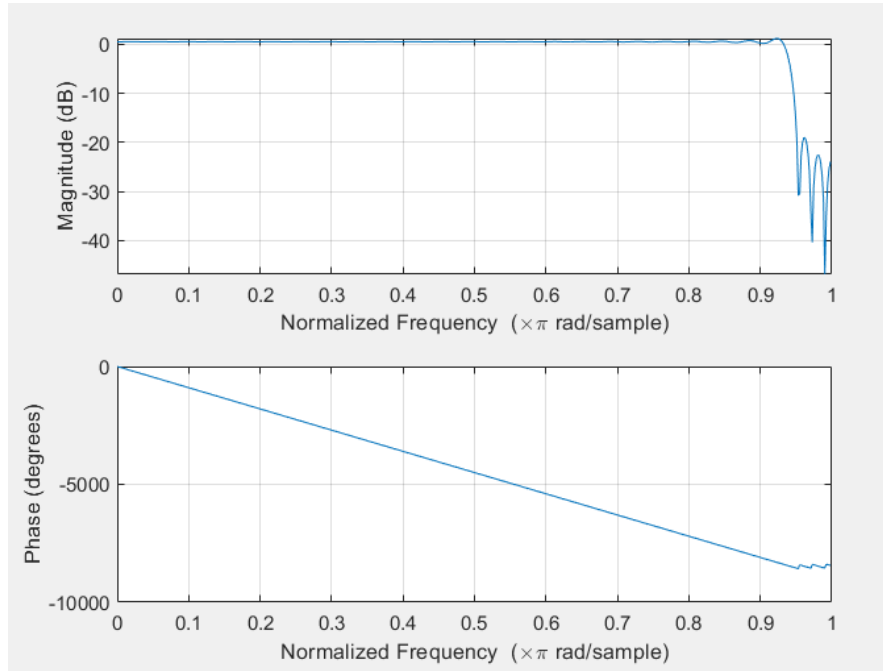
**Matlab Code:-**



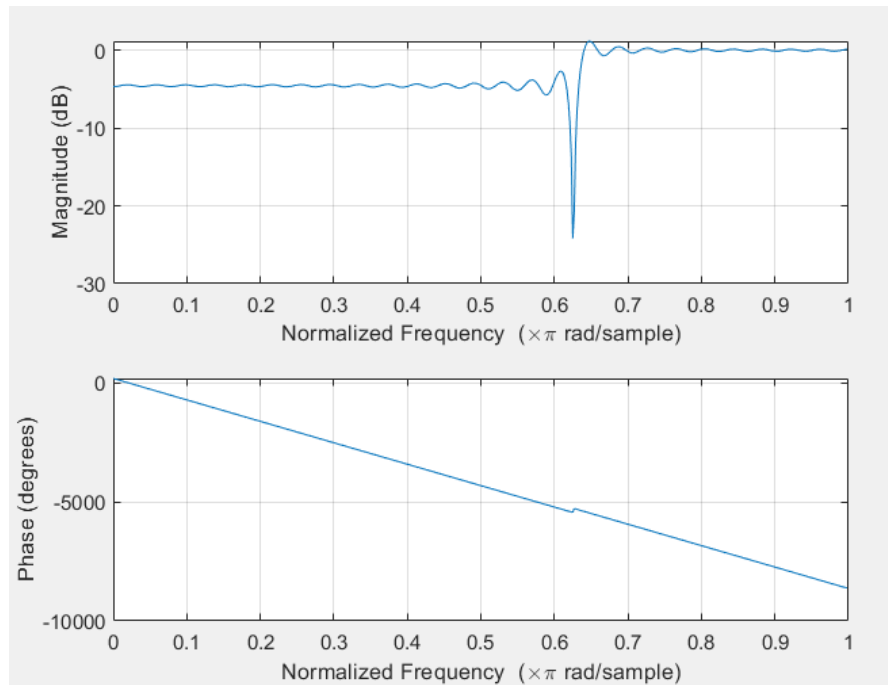
```
first.m x second.m x third.m x +
1 -   clc;
2 -   clear
3 -   close all;
4
5 -   wcl=0.3*pi;
6 -   wch=0.2*pi;
7 -   n=101;
8 -   m=(n-1)/2;
9 -   l= -m:m;
10 -  h1= sinc(wcl*l);
11 -  figure,freqz(h1);
12 -  h2= -1*(sinc(wch*l));
13 -  h2(m+1)=h2(m+1)+1;
14 -  figure,freqz(h2)
15 -  h3= h1-h2;
16 -  figure,freqz(h3)
17 -  h4= h1+h2;
18 -  figure,freqz(h4)
```

**Fig.1.matlab code for problem-1**

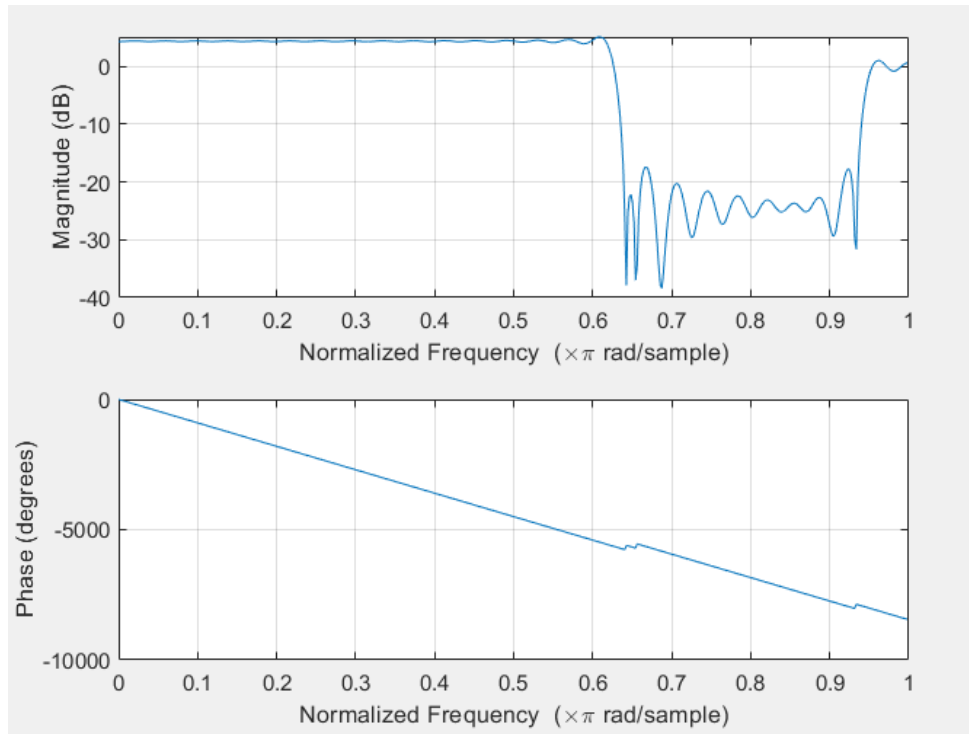
## **Output:-**



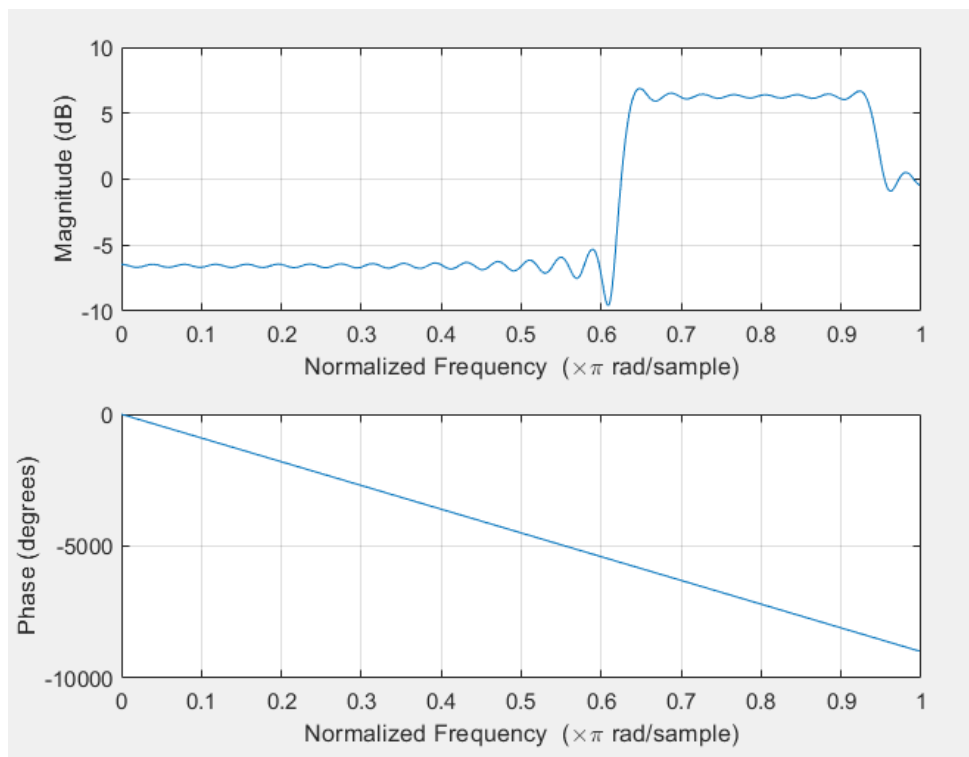
**Fig.2.matlab results for problem-1(output of low pass filter)**



**Fig.3.matlab results for problem-1(output of high pass filter)**



**Fig.4.matlab results for problem-1(output of band-stop filter)**



**Fig.5.matlab results for problem-1(output of band-pass filter)**

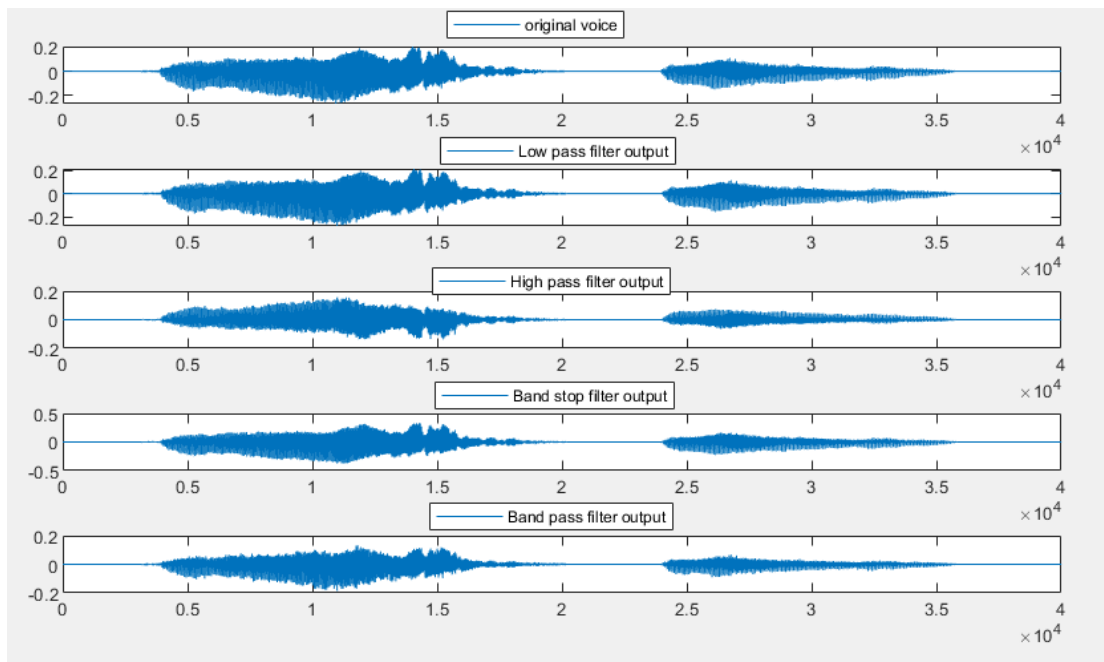
## **Problem-2:- Passing a voice signal through lowpass,highpass,bandpass and bandstop filter**

### **Matlab Code:-**

```
clc
clear all
close all
original_voice = audiorecorder;
disp('Start record. '); recordblocking(original_voice, 5);
disp('End record '); play(original_voice);
data_number = getaudiodata(original_voice);
subplot(511),plot(data_number),legend('original voice'); wcl=0.30*pi;
wch=0.2*pi; n=101;
m=(n-1)/2;
l= -m:m;
h1= sinc(wcl*l); a1=conv(data_number,h1); sound(a1)
subplot(512),plot(a1),xlim([0 length(data_number)]),legend('Low pass filter output');
h2= -1*(sinc(wch*l)); h2(m+1)=h2(m+1)+1;
a2=conv(data_number,h2) ;sound(a2);
subplot(513),plot(a2),xlim([0 length(data_number)]),legend('High pass filter output');
h3= h1-h2; a3=conv(data_number,h3); sound(a3);
subplot(514),plot(a3),xlim([0 length(data_number)]),legend('Band stop filter output');
h4= h1+h2; a4=conv(data_number,h4) ;sound(a4);
subplot(515),plot(a4),xlim([0 length(data_number)]),legend('Band pass filter output');
```

**Fig.6.matlab code for problem-2**

### **Output:-**



**Fig.7.matlab results for problem-2**

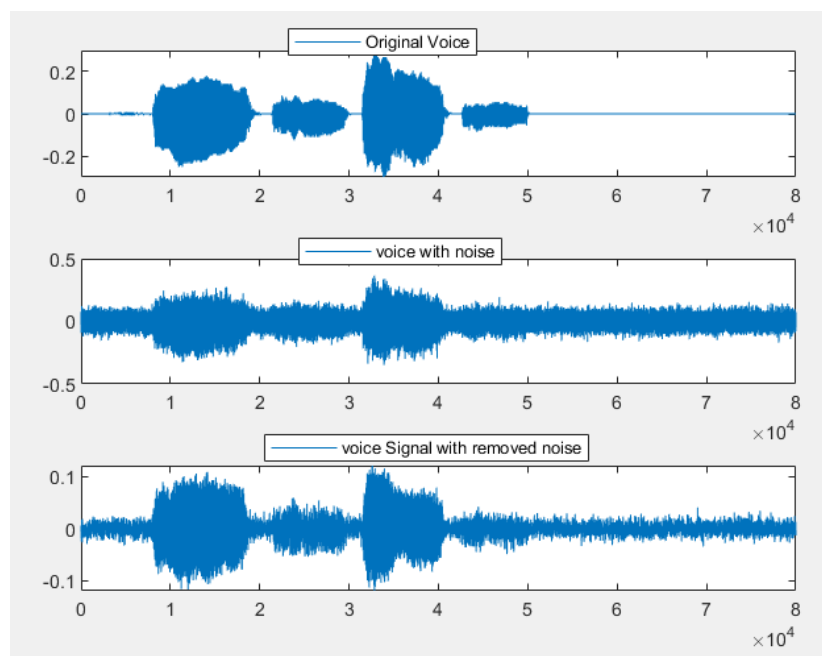
### **Problem-3:- Adding Noise with Original Voice record and removing it by moving average method**

#### **Matlab Code:-**

```
1 - clc
2 - clear
3 - t=0:0.1:1;
4 - y=audiorecorder;
5 - disp('Start recording');
6 - recordblocking(y,10);
7 - disp('End of recording');
8 - play(y)
9 - num_data=getaudiodata(y);
10 - x=num_data;
11 - subplot(311)
12 - plot(x)
13 - legend('Original Voice')
14 - a=awgn(x,1,'measured');
15 - subplot(312);
16 - plot(a)
17 - legend('voice with noise')
18 - r=movmean(a,20)
19 - subplot(313);
20 - plot(r);
21 - legend('voice Signal with removed noise')
```

**Fig.8.matlab code for problem-3**

#### **Output:-**



**Fig.9.matlab results for problem-3**