Problem-1:- Linear phase FIR filter design using Bartlett window of Low pass,High Pass,Bandpass and Bandstop filter.

Matlab code for Low pass filter:-

```
clc;clear all;close all;
n=30
fp=200;fq=300;fs=1000;fn=2*fp/fs;
window=bartlett(n+1)
b=fir1(n,fn,window)
[H W]=freqz(b,1,128)
subplot(2,1,1)
plot(W/pi,10*log(abs(H)))
title('magnitude response')
ylabel('gain in dB')
xlabel('normalized frequency')
subplot(2,1,2)
plot(W/pi,angle(H))
title('phase response')
ylabel('angle')
xlabel('normalized frequency')
```

Matlab code for high pass filter:-

```
clc;clear all;close all;
n=30
fp=300;fq=200;fs=1000;fn=2*fp/fs;
window=bartlett(n+1)
b=fir1(n,fn,'high',window)
[H W]=freqz(b,1,128)
subplot(2,1,1)
plot(W/pi,10*log(abs(H)))
title('magnitude response')
ylabel('gain in dB')
xlabel('normalized frequency')
subplot(2,1,2)
plot(W/pi,angle(H))
title('phase response')
ylabel('angle')
xlabel('normalized frequency')
```

Matlab code for band pass filter:-

```
clc;clear all;close all;n=30;
window=bartlett(n+1)
b=fir1(n,[.38 .48],window)
[H W]=freqz(b,1,128)
subplot(2,1,1)
plot(W/pi,10*log(abs(H)))
title('magnitude response')
ylabel('gain in dB')
xlabel('normalized frequency')
subplot(2,1,2)
plot(W/pi,angle(H))
title('phase response')
ylabel('angle')
xlabel('normalized frequency')
```

Matlab code for band stop filter:-

```
clc;clear all;close all;
n=30
window=bartlett(n+1)
b=fir1(n,[.38 .48],'stop',window)
[H W]=freqz(b,1,128)
subplot(2,1,1)
plot(W/pi,10*log(abs(H)))
title('magnitude response')
ylabel('gain in dB')
xlabel('normalized frequency')
subplot(2,1,2)
plot(W/pi,angle(H))
title('phase response')
ylabel('angle')
xlabel('normalized frequency')
```

Output for low pass filter (bartlett window):-

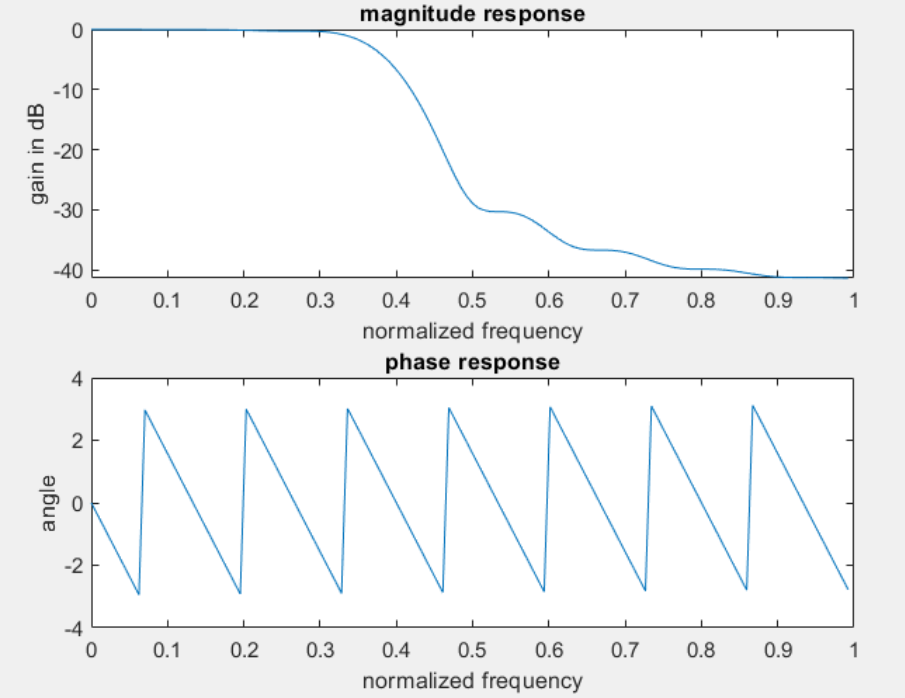

Fig.1. magnitude and phase reponse of low pass filter using bartlett window

Output for high pass filter (bartlett window):-

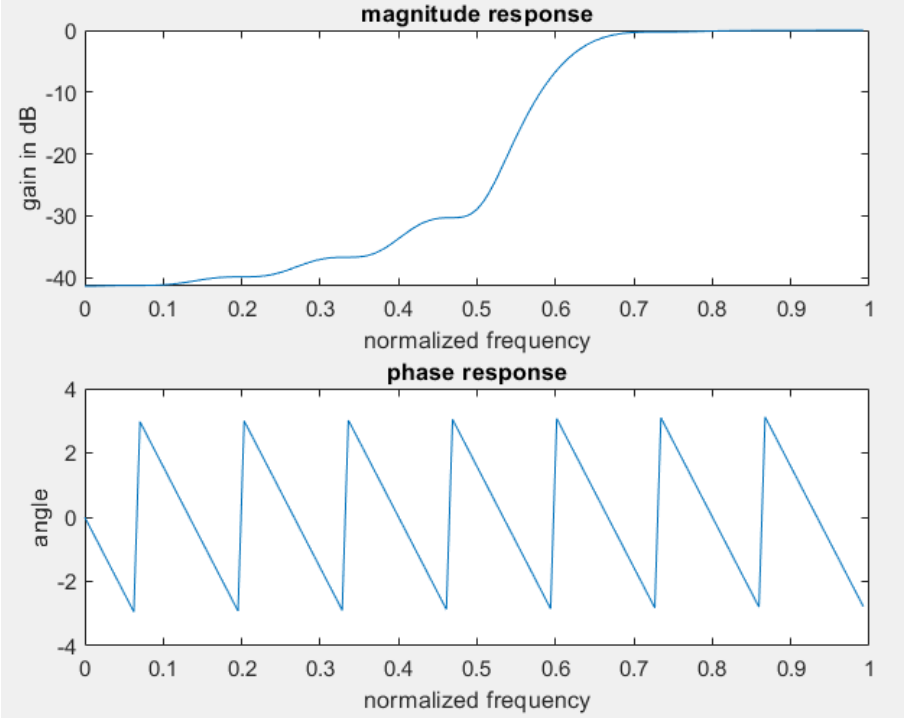

Fig.2. magnitude and phase reponse of high pass filter using bartlett window

Output for band pass filter (bartlett window):-

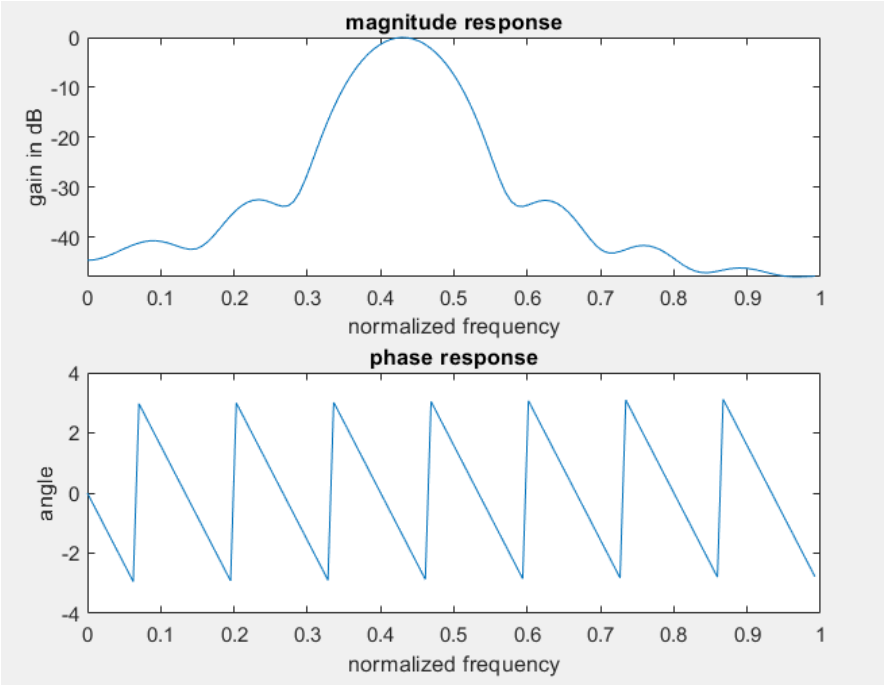

Fig.3. magnitude and phase reponse of band pass filter using bartlett window

Output for band stop filter (bartlett window):-

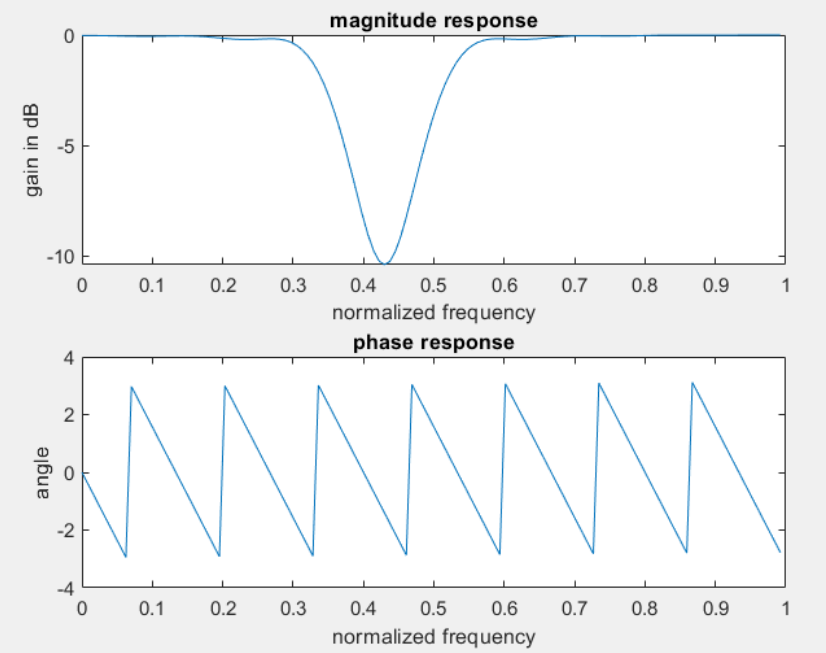

Fig.4. magnitude and phase reponse of band stop filter using bartlett window

Problem-2:- Linear phase FIR filter design using Kaiser window of Low pass,High Pass,Bandpass and Bandstop filter.

Matlab code for Low pass filter:-

```
clc;clear all;close all;
n=30
fp=200;fq=300;fs=1000;fn=2*fp/fs;
window=kaiser(n+1,0.5)
b=fir1(n,fn,window)
[H W]=freqz(b,1,128)
subplot(2,1,1)
plot(W/pi,10*log(abs(H)))
title('magnitude response')
ylabel('gain in dB')
xlabel('normalized frequency')
subplot(2,1,2)
plot(W/pi,angle(H))
title('phase response')
ylabel('angle')
xlabel('normalized frequency')
```

Matlab code for high pass filter:-

```
clc;clear all;close all;
n=30
fp=300;fq=200;fs=1000;fn=2*fp/fs;
window=kaiser(n+1,0.5)
```

```
b=fir1(n,fn,'high',window)
[H W]=freqz(b,1,128)
subplot(2,1,1)
plot(W/pi,10*log(abs(H)))
title('magnitude response')
ylabel('gain in dB')
xlabel('normalized frequency')
subplot(2,1,2)
plot(W/pi,angle(H))
title('phase response')
ylabel('angle')
xlabel('normalized frequency')
```

Matlab code for band pass filter:-

```
clc;clear all;close all;
n=30
window=kaiser(n+1,0.5)
b=fir1(n,[.38 .48],window)
[H W]=freqz(b,1,128)
subplot(2,1,1)
plot(W/pi,10*log(abs(H)))
title('magnitude response')
ylabel('gain in dB')
xlabel('normalized frequency')
subplot(2,1,2)
plot(W/pi,angle(H))
title('phase response')
ylabel('angle')
xlabel('normalized frequency')
```

Matlab code for band stop filter:-

```
clc;clear all;close all;
n=30
window=kaiser(n+1,0.5)
b=fir1(n,[.38 .48],'stop',window)
[H W]=freqz(b,1,128)
subplot(2,1,1)
plot(W/pi,10*log(abs(H)))
title('magnitude response')
ylabel('gain in dB')
xlabel('normalized frequency')
subplot(2,1,2)
plot(W/pi,angle(H))
title('phase response')
ylabel('angle')
xlabel('normalized frequency')
```

Output for low pass filter (kaiser window):-

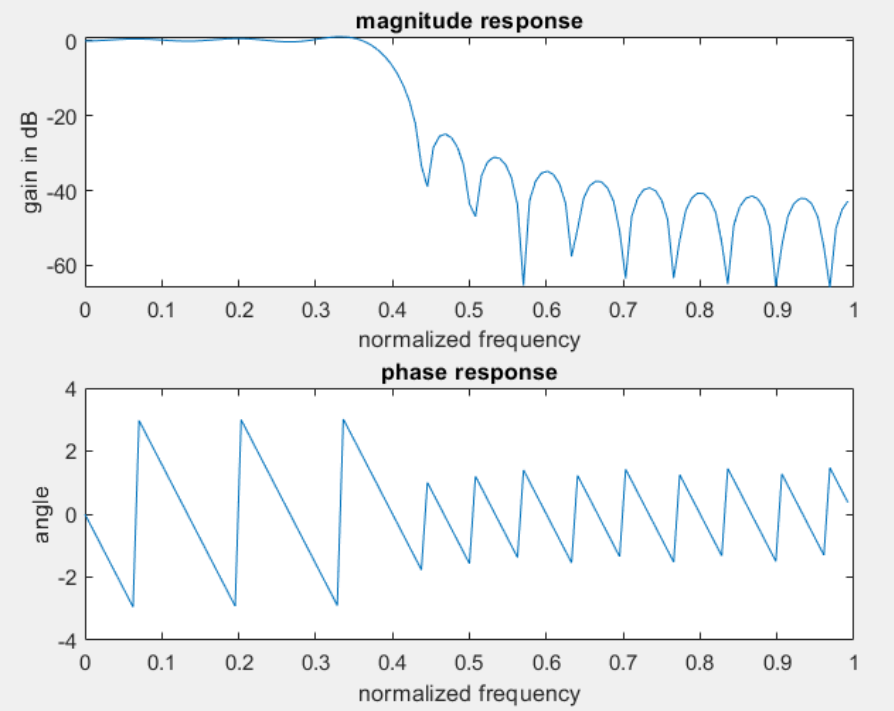

Fig.5. magnitude and phase reponse of low pass filter using kaiser window

Output for high pass filter (kaiser window):-

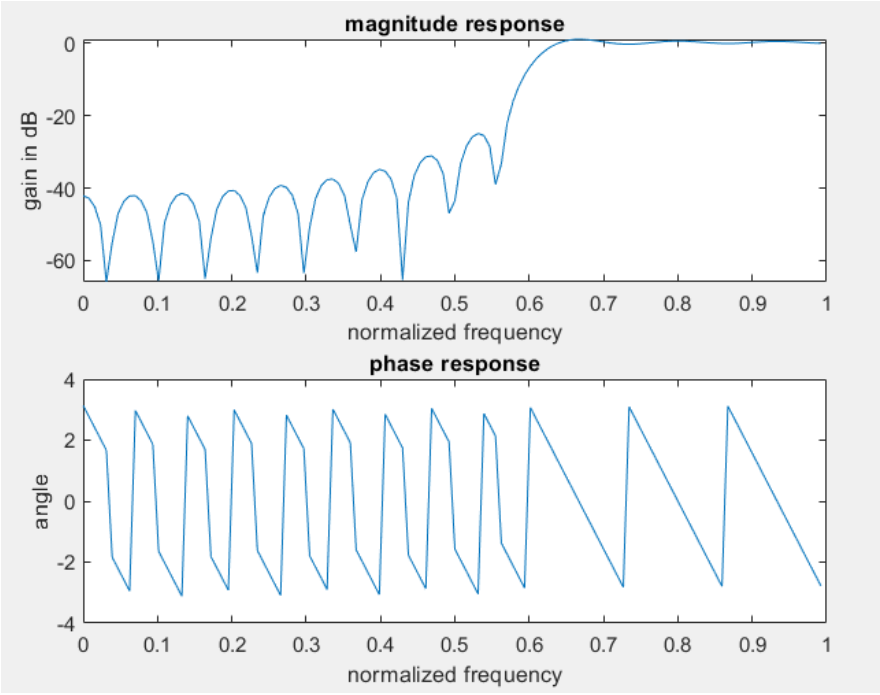

Fig.6. magnitude and phase reponse of high pass filter using kaiser window

Output for band pass filter (kaiser window):-

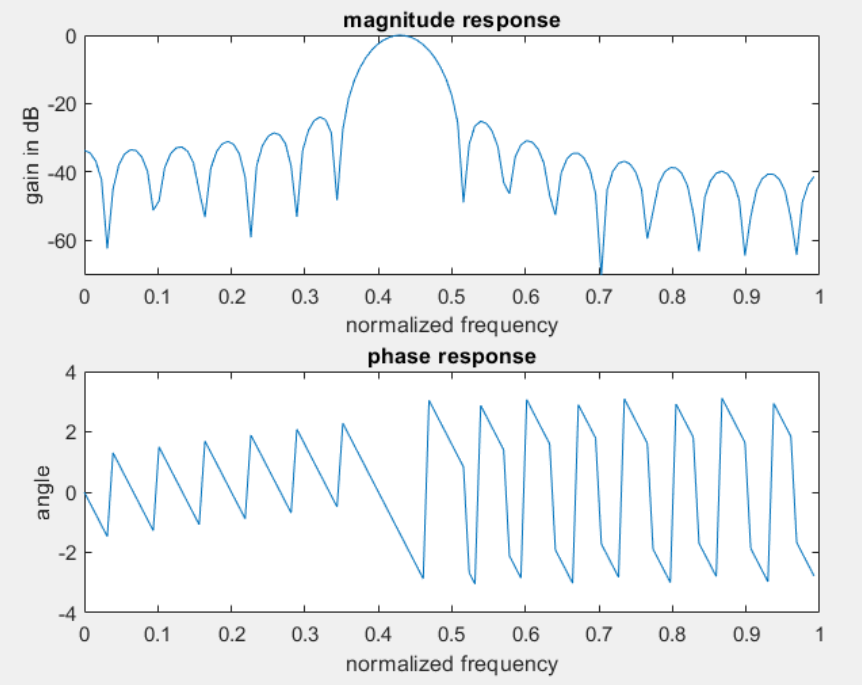

Fig.7. magnitude and phase reponse of band pass filter using kaiser window

Output for band stop filter (kaiser window):-

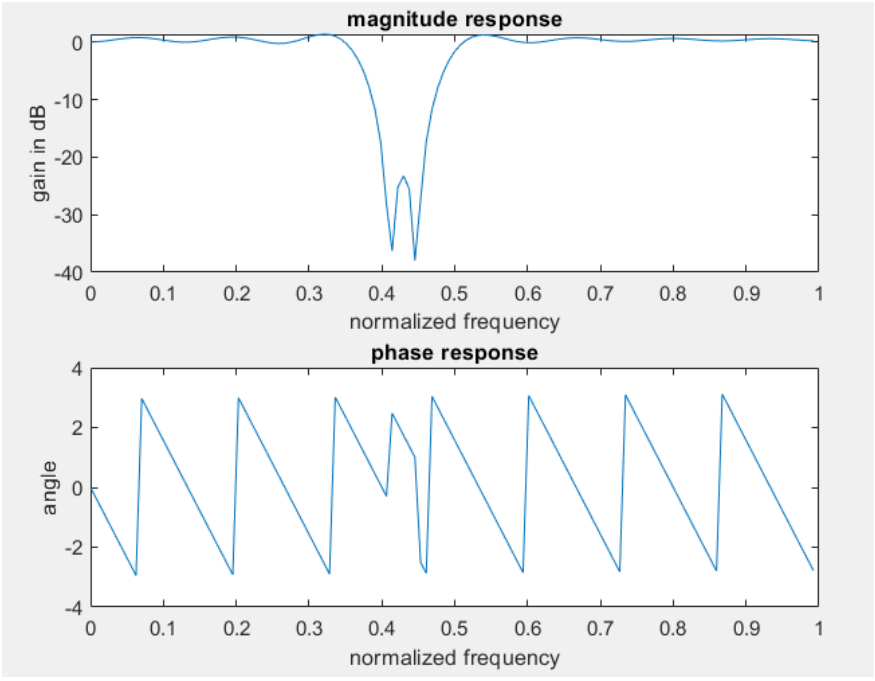

Fig.8. magnitude and phase reponse of band stop filter using kaiser window