```
% Butterworth Low Pass Filter
clc;
close all;
alphas = 30;
alphap = 0.5;
fpass=1000;
fstop=1500;
fsam=5000;
wp=2 *fpass/fsam;
ws=2*fstop/fsam;
[n,wn] = buttord(wp,ws,alphap,alphas);
[b,a] = butter(n,wn);
[h,w] = freqz(b,a);

subplot(2,1,1);
plot(w/pi,20*log10(abs(h)));
xlabel('Normalized Frequency');
ylabel('Gain [db]');
title('Magnitude response');

subplot(2,1,2);
plot(w/pi,angle(h));
xlabel('Normalized Frequency');
ylabel('Phase [radians]');
title('Phase response');
```

```
% Butterworth High Pass Filter
clc;
close all;
alphas = 50;
alphap= 1;
fp=1050;
fs=600;
fsam=3500;
wp=2*fp/fsam;
ws=2 *fs/fsam;
[n,wn] = buttord(wp,ws,alphap,alphas);
[b,a] = butter(n,wn,'high');
[h,w] = freqz(b,a);

subplot(2,1,1);
plot(w/pi,20*log10(abs(h)));
xlabel('Normalized Frequency');
ylabel('Gain [db]');
title('Magnitude response');

subplot(2,1,2);
plot(w/pi,angle(h));
xlabel('Normalized Frequency');
ylabel('Phase [radians]');
title('Phase response');
```

```
% Butterworth Band Stop Filter
clc;
close all;
ws = [0.4 0.6];
wp = [0.3 0.7];
alphap = 0.4;
alphas = 50;
[n,wn] = buttord(wp,ws,alphap,alphas);
[b,a] = butter(n,wn,'stop');
[h,w] = freqz(b,a);

subplot(2,1,1);
plot(w/pi,20*log10(abs(h)));
xlabel('Normalized Frequency');
ylabel('Gain [db]');
title('Magnitude response');

subplot(2,1,2);
plot(w/pi,angle(h));
xlabel('Normalized Frequency');
ylabel('Phase [radians]');
title('Phase response');
```

```
% Butterworth Band Pass Filter
clc;
close all;
ws = [0.3 0.7];
wp = [0.4 0.6];
alphap = 0.4;
alphas = 50;
[n, wn] = buttord(wp, ws, alphap, alphas);
[b, a] = butter(n, wn, 'bandpass');
[h, w] = freqz(b, a);

subplot(2,1,1);
plot(w/pi, 20*log10(abs(h)));
xlabel('Normalized Frequency');
ylabel('Gain [dB]');
title('Magnitude Response - Bandpass
Filter');

subplot(2,1,2);
plot(w/pi, angle(h));
xlabel('Normalized Frequency');
ylabel('Phase [radians]');
title('Phase Response - Bandpass Filter');
```

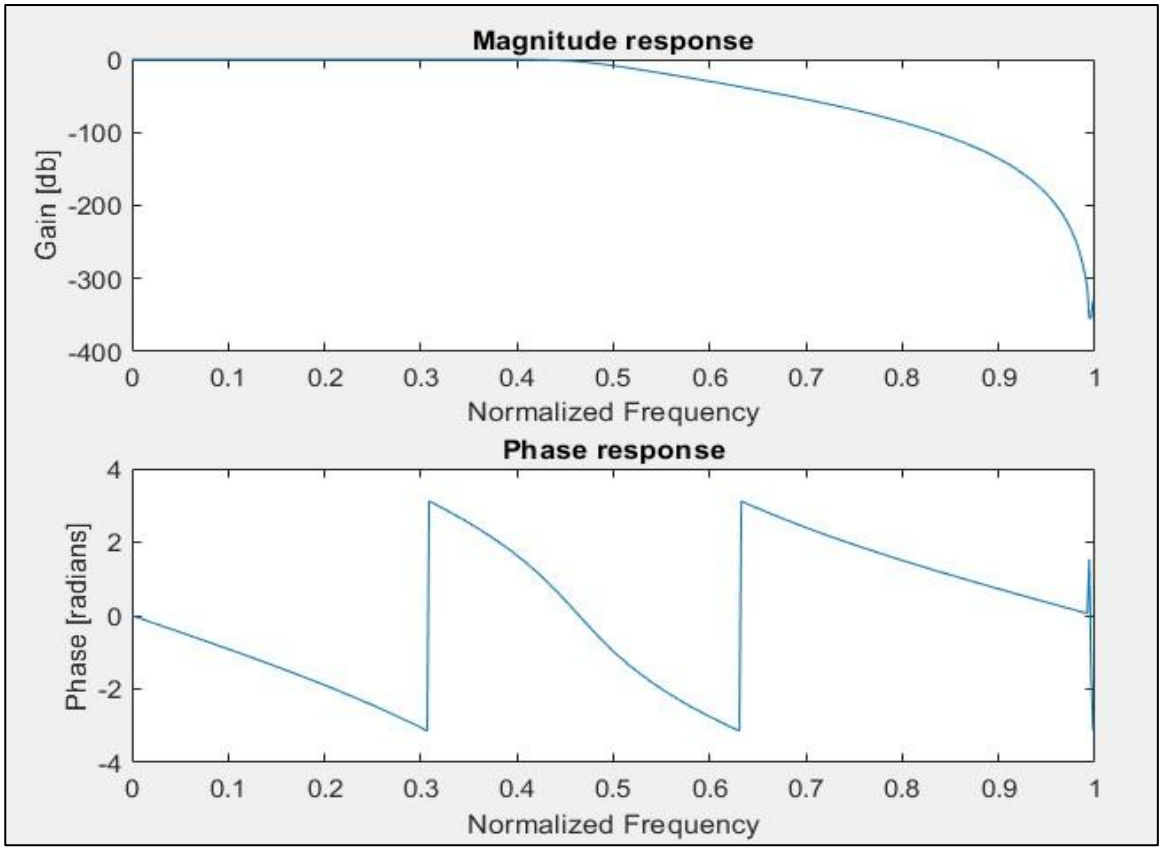

Fig. i) Butterworth Low Pass Filter

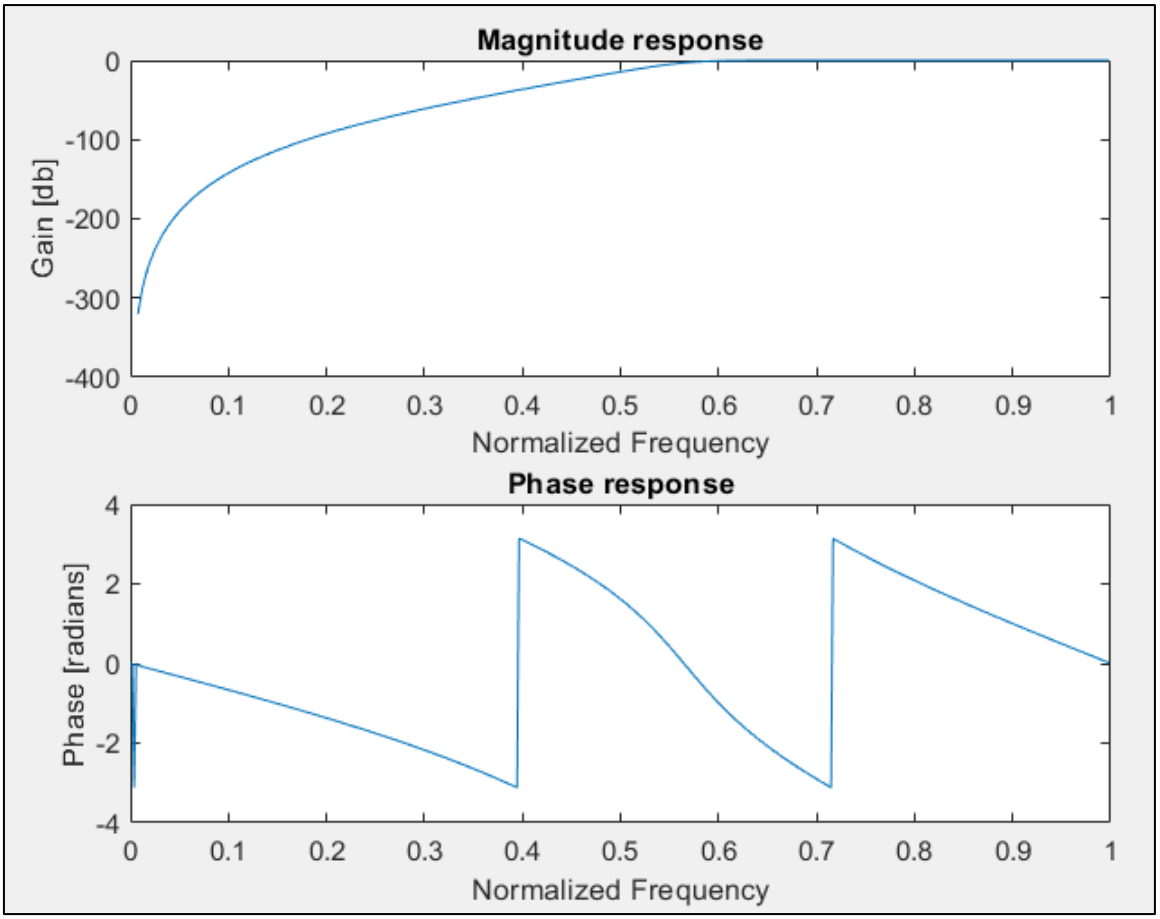

Fig. ii) Butterworth High Pass Filter

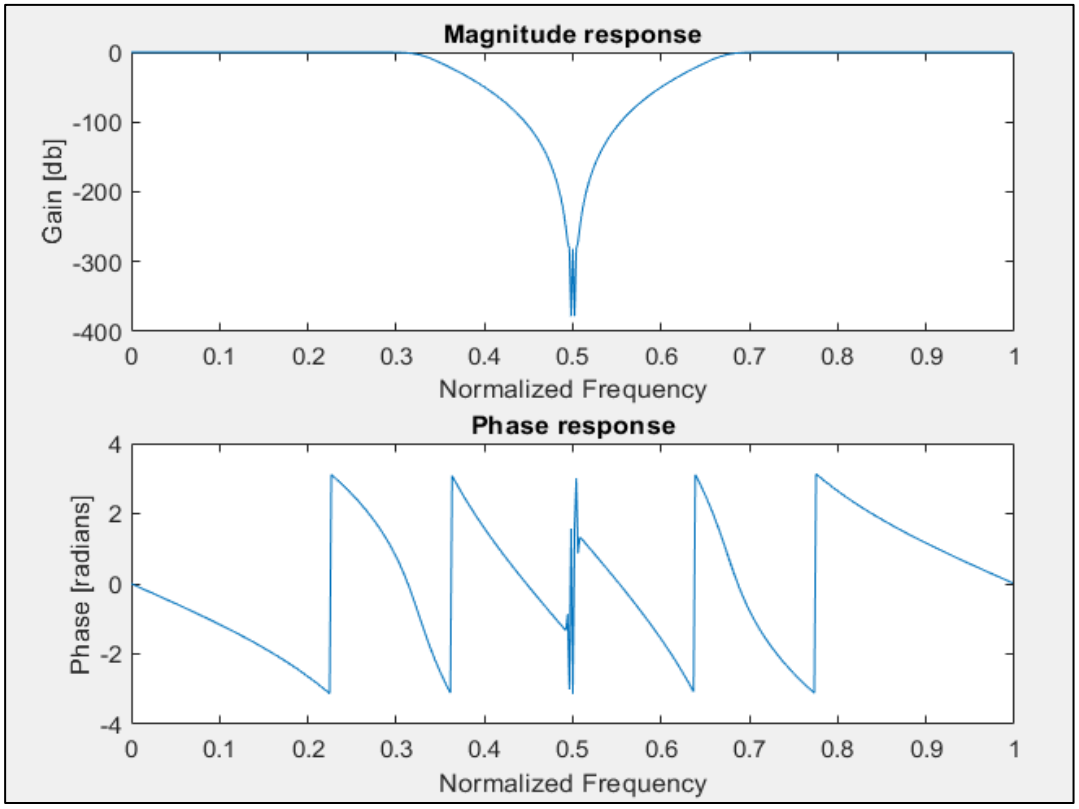

Fig. iii) Butterworth Band Stop Filter

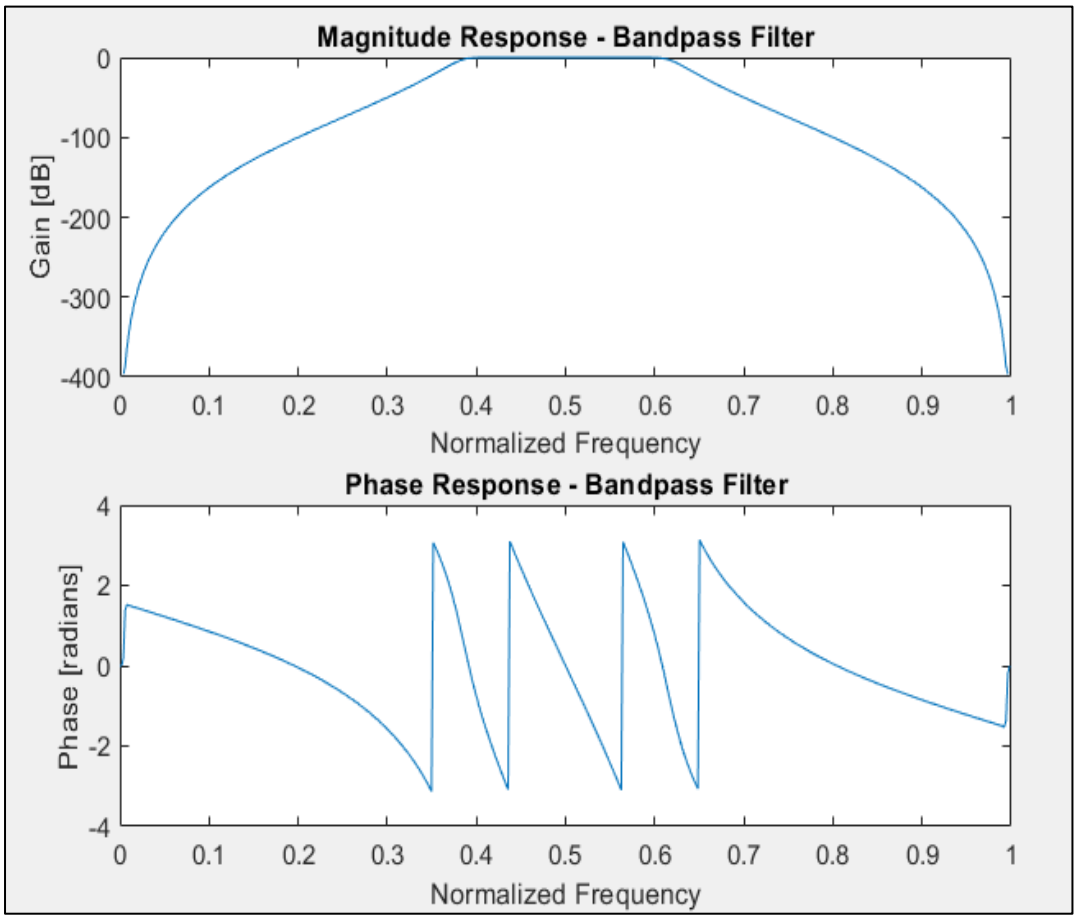

Fig. iv) Butterworth Band Pass Filter