**Implementation of IIR Filter**

clc;

clear all

close all

h=fir1(33,150/(1000/2),hamming(34)); To find Impulse Response

n=1:30;

f1=50; f2=300; f3=200; fs=1000;

x=[];

x1=sin(2\*pi\*n\*f1/fs);

x2=sin(2\*pi\*n\*f2/fs);

x3=sin(2\*pi\*n\*f3/fs);

x=[x1 x2 x3];

subplot(2,1,1);

stem(x);

title('Input signal')

y=filter(h,1,x)

%y=conv(h,x)

subplot(2,1,2);

stem(y);

title('Output signal')

**Design of FIR filter**

clc;

clear all

close all

wpa=input('Enter passband frequency in Hz');

wsa=input('Enter stopband frequency in Hz');

ws1=input('Enter Sampling frequency in Hz');

wpd=2\*pi\*wpa/ws1; Analog to Digital Conversion

wsd=2\*pi\*wsa/ws1;

tb=wsd-wpd; Transmission Bandwidth

fb=1/tb;

N=ceil(6.6\*pi\*fb); Order of the filter

Wc=(wsd+wpd)/2;

wc=Wc/pi; Cutoff Frequency

hw=hamming(N+1); Hamming window

stem(hw);

title('Hamming window');

h=fir1(N,wc,hamming(N+1)); Impulse Response

figure(2);

[m,w]=freqz(h,1,128);

mag=20\*log10(abs(m)); Magnitude in dB

plot(ws1\*w/(2\*pi),mag); Digital to Analog frequency

title('FIR frequency Response');

grid on;

**Implementation of IIR Filter**

[b,a]=butter(2,150/(1000/2));

n=1:30;

f1=100; f2=300; f3=170; fs=1000;

x=[];

x1=sin(2\*pi\*n\*f1/fs);

x2=sin(2\*pi\*n\*f2/fs);

x3=sin(2\*pi\*n\*f3/fs);

x=[x1 x2 x3];

subplot(2,1,1);

stem(x);

title('Input signal')

y=filter(b,a,x)

subplot(2,1,2);

stem(y);

title('Output signal')

**Design of IIR Filter**

**Butterworth Approximation**

rp=1, rs=40, w1=800, w2=1200, ws=3600;

aw1=2\*pi\*w1/ws; Analog to Digital Conversion

aw2=2\*pi\*w2/ws;

pw1=2\*tan(aw1/2); Pre warpping

pw2=2\*tan(aw2/2);

[n,wc]=buttord(pw1,pw2,rp,rs,'s'); Order and Cutoff frequency

[b,a]=butter(n,wc,'s'); Numerator and Denominator

fs=1;

[num,den]=bilinear(b,a,fs); Converting from S Domain to Z Domain using BT

[mag,freq1]=freqz(num,den,128); Magnitude and frequency

freq=freq1\*ws/(2\*pi); Digital to Analog frequency

m=20\*log10(abs(mag)); Magnitude in dB

plot(freq,m);

grid;

**Chebyshev Approximation**

rp=1, rs=40, w1=800, w2=1200, ws=3600;

aw1=2\*pi\*w1/ws; Analog to Digital Conversion

aw2=2\*pi\*w2/ws;

pw1=2\*tan(aw1/2); Pre warpping

pw2=2\*tan(aw2/2);

[n,wc]=cheb1ord(pw1,pw2,rp,rs,'s'); Order and Cutoff frequency

[b,a]=cheby1(n,rp,wc,'s'); Numerator and Denominator

fs=1;

[num,den]=bilinear(b,a,fs); Converting from S Domain to Z Domain using BT

[mag,freq1]=freqz(num,den,128); Magnitude and frequency

freq=freq1\*ws/(2\*pi); Digital to Analog frequency

m=20\*log10(abs(mag)); Magnitude in dB

plot(freq,m);

grid;