8. IIR BUTTERWORTH FILTER IMPLEMENTATION

AIM: Program for Design of Butterworth Analog Low-pass/High-pass Filter.

SOFTWARE: MATLAB

PROGRAM:

```
% To implement LP IIR filter for a given sequence
clc;
close all;
clear all;
format long
rp=input('enter the passband ripple');
rs=input('enter the stopband ripple');
wp=input('enter the passband freq');
ws=input('enter the stopband freq');
fs=input('enter the sampling freq');
w1=2*wp/fs;
w2=2*ws/fs;
% LPF
[n,wn]= buttord(w1,w2,rp,rs);
[b,a]= butter(n,wn);
w = 0:.01:pi;
[h,om]=freqz(b,a,w);
m=20*log10(abs(h));
an=angle(h);
figure(1)
subplot(2,1,1);plot(om/pi,m);
ylabel('Gain in dB --.');
xlabel('(a) Normalised frequency --.');
grid on
subplot(2,1,2);
plot(om/pi,an);
xlabel('(b) Normalised frequency --.');
ylabel('Phase in radians --.');
grid on

% HPF
[n,wn]=buttord(w1,w2,rp,rs,'s');
[b,a]=butter(n,wn,'high','s');
w=0:.01:pi;
[h,om]=freqz(b,a,w);
m=20*log10(abs(h));
an=angle(h);
figure(2)
subplot(2,1,1);
plot(om/pi,m);
ylabel('Gain in dB --.');
```

```
xlabel('(a) Normalised frequency --.');
grid on
subplot(2,1,2);
plot(om/pi,an);
xlabel('(b) Normalised frequency --.');
ylabel('Phase in radians --.');
grid on
```

INPUT::
enter the passband ripple: 10

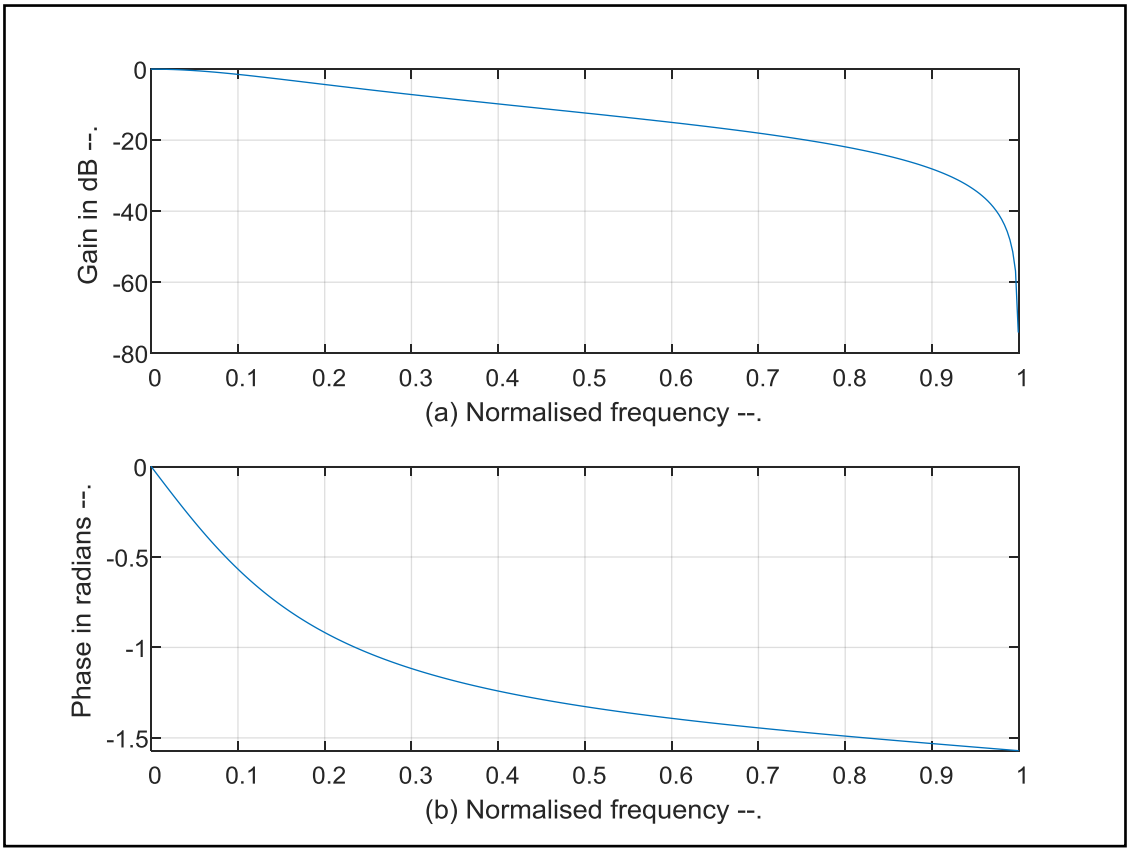
enter the stopband ripple: 15

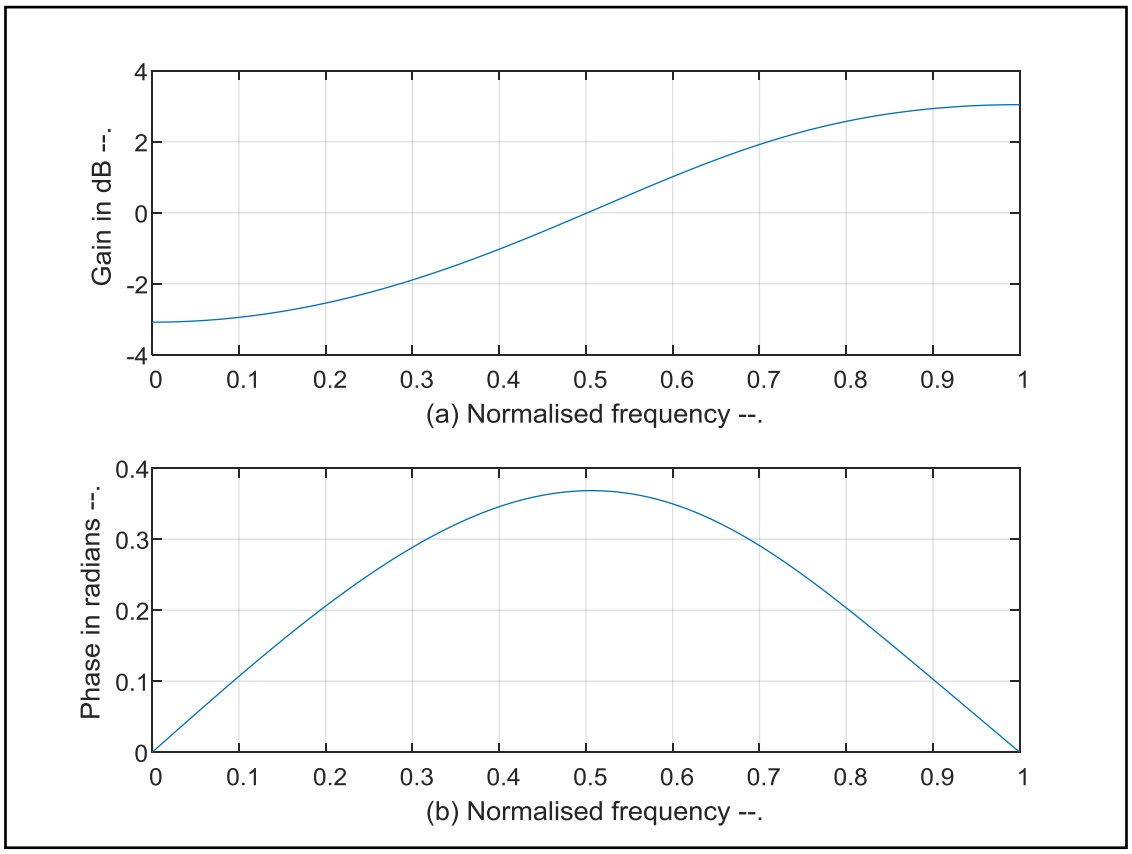
enter the passband frequency: 1000

enter the stopband frequency: 1500

enter the sampling frequency: 5000

OUTPUT:





RESULT:

Thus the MATLAB program for IIR LP\HP using butterworth filter and its frequency response is also verified.