MATLAB Programs

Program 1

Write a program to design an LPF using backward difference method.

```
clear all;
B=[0.001];
A=[1.001 -1];
freqz(B,A,256,100);title('magnitude and phase plot for LPF-
using backward difference method with T=0.01');
```

Output

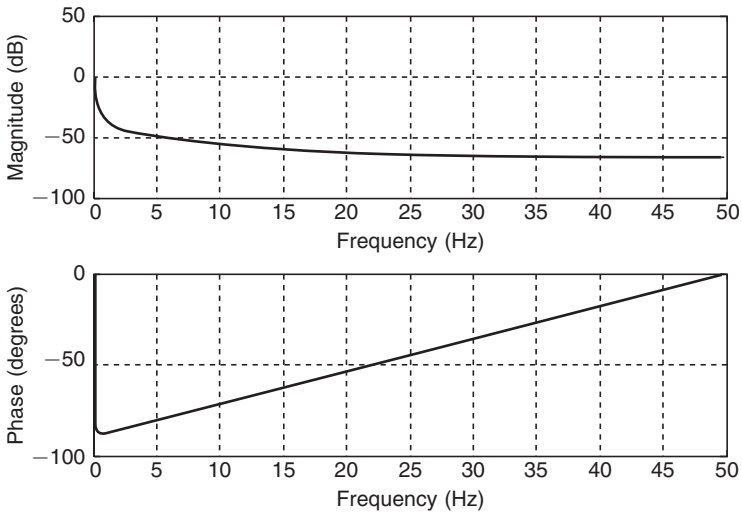

Figure 1 Magnitude and phase plot for LPF with $T = 0.01$ using backward difference method.

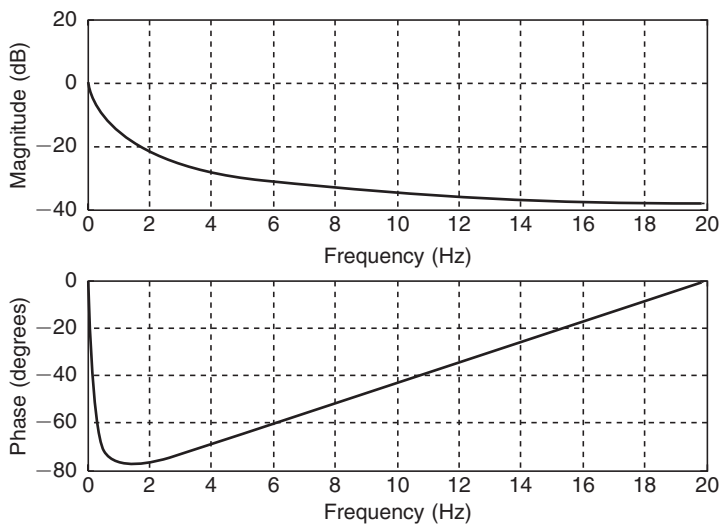

Figure 2 Magnitude and phase plot for LPF with $T = 0.025$ using backward difference method.

Program 2

Write a program to design a BPF using backward difference method.

```
clear all;
B=[0.009];
A=[1 -1.81960 0.9008];
freqz(B,A,256,10);title('magnitude and phase plot for BPF-
using backward difference method with T=0.1');
```

Output

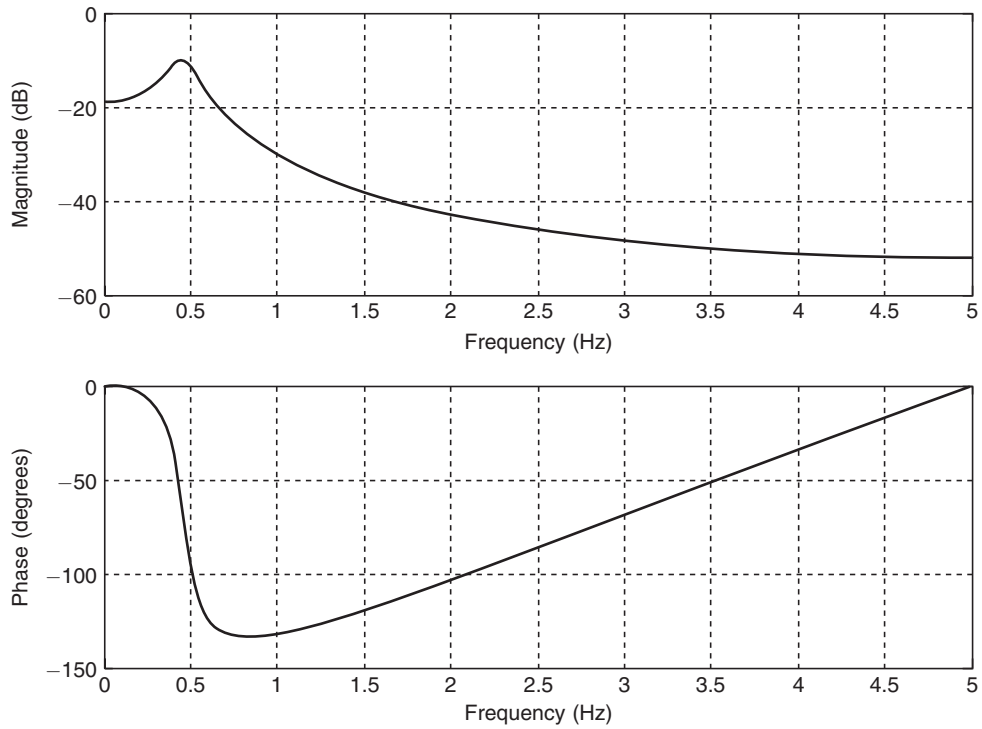

Figure 3 Magnitude and phase plot for BPF with $T = 0.1$ using backward difference method.

Program 3

Write a program to design Butterworth LPF using BLT.

```
%Butterworth LPF magnitude and phase plot for design using
BLTclear all;
B=[0.0.0676 0.1352 0.0676];
```

```
A=[1 -1.1422 0.4124];
freqz(B,A,256,10000);title('magnitude and phase plot for LPF
DT butterworth filter -using BLT method ')
```

Output

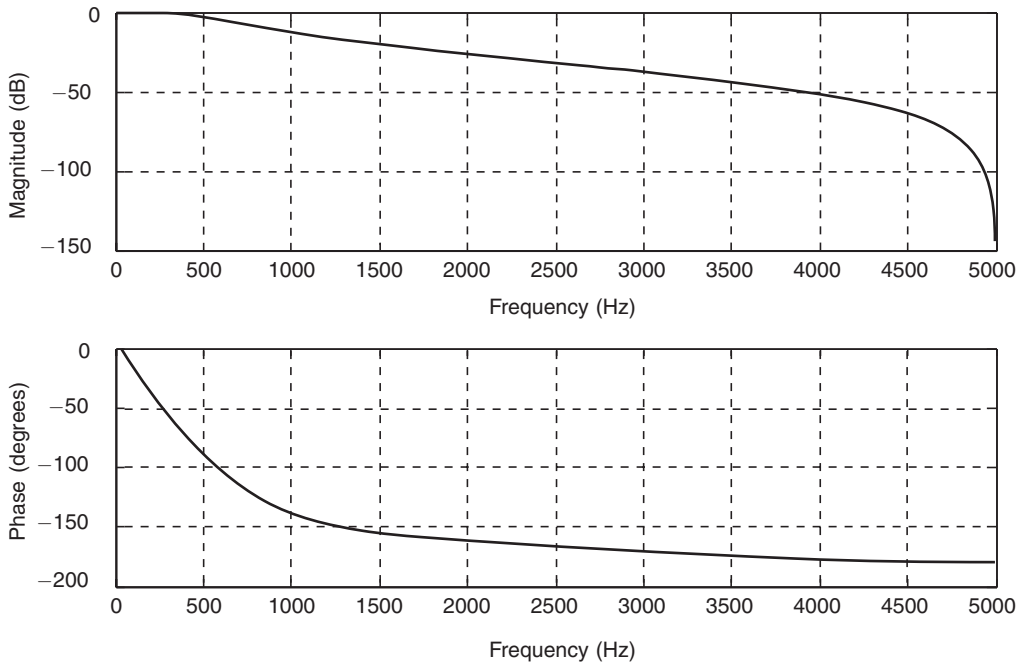

Figure 4 Magnitude and phase response of LPF using Butterworth filter.

Program 4

Write a program to plot magnitude and phase for HPF using BLT.

```
%magnitude and phase plot for
clear all;
B=[1 -2 1];
A=[0.6462 -1.7884 1.5654];
freqz(B,A,256,10000);title('magnitude and phase plot for HPF
DT butterworth filter -using BLT method ');
```

Output

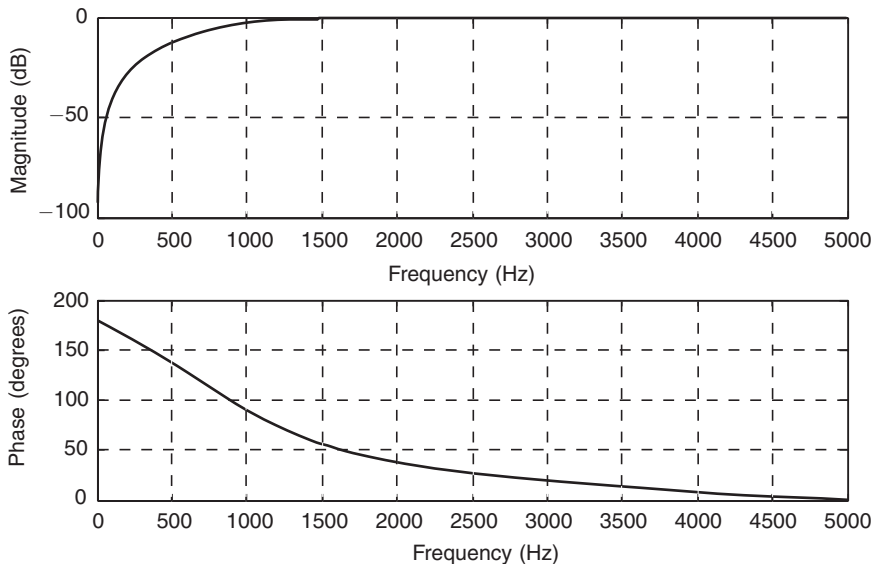

Figure 5 Magnitude and phase plots for HPF with cut-off frequency of 1000 Hz.

Program 5

Write a program to plot magnitude and phase for BPF using BLT.

```
%Magnitude and phase plot for BPF
clear all;
B=[0.4015 0.0 -0.4015];
A=[1.6376 -1.5278 0.8346];
freqz(B,A,256,10000);title('magnitude and phase plot for BPF
DT butterworth filter -using BLT method ');
```

Output

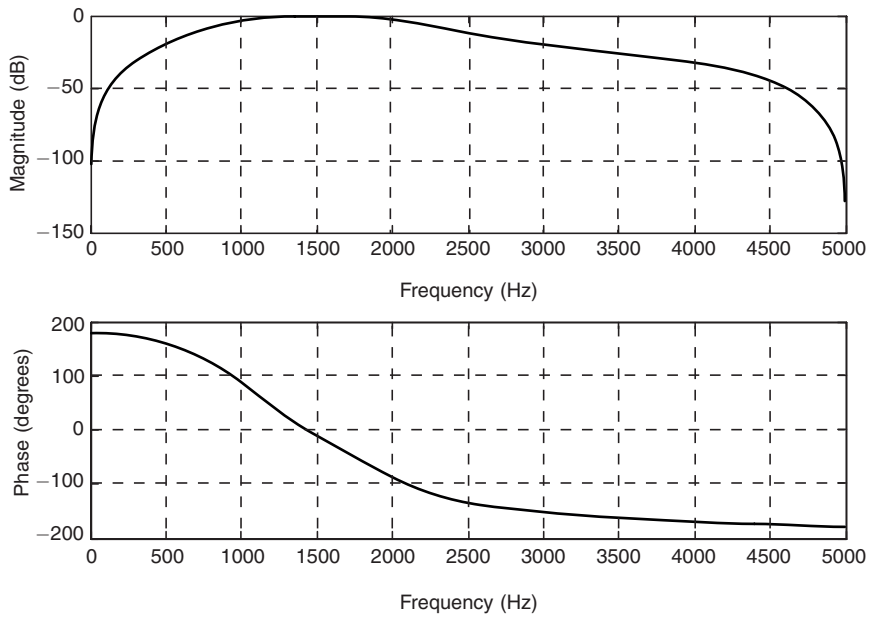

Figure 6 Magnitude and phase plot for BPF.

Program 6

Write a program to plot magnitude and phase for BRF.

```
%BRF magnitude and phase plot
clear all;
B=[1.2361 -1.5278 1.2361];
A=[1.6376 -1.5278 0.8346];
freqz(B,A,256,10000);title('magnitude and phase plot for BRF
DT butterworth filter -using BLT method ');
```

Output

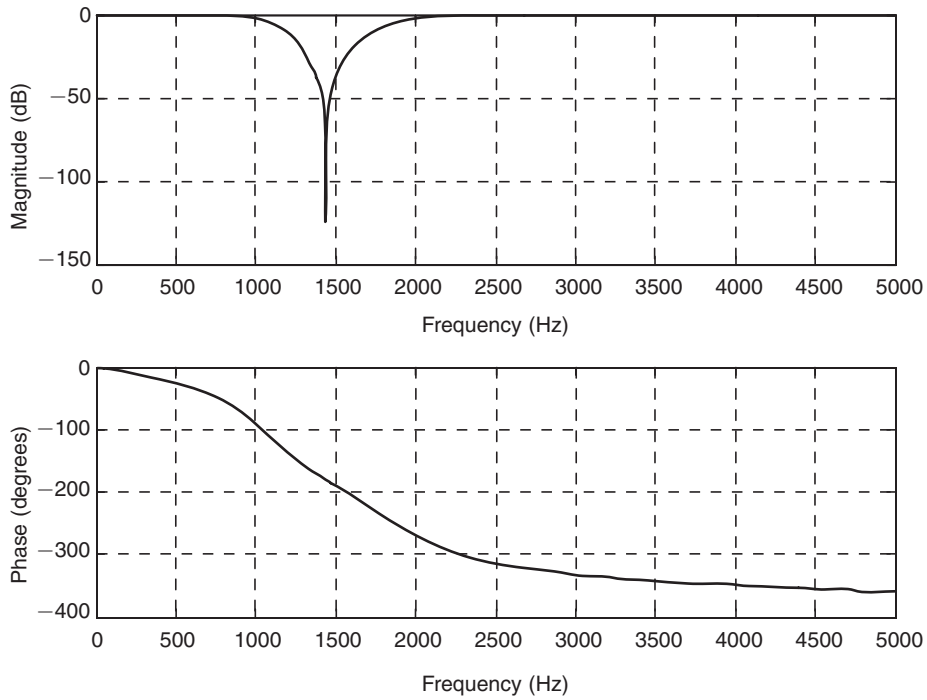

Figure 7 Magnitude and phase plot.

Program 7

Write a program to plot magnitude and phase for LPF DT Butterworth filter using BLT method with −3 dB attenuation at frequency of 1000 Hz and an attenuation of 40 dB at frequency of 2600 Hz and sampling frequency of 10000 Hz.

```
%magnitude and phase plot
clear all;
B=[0.011156 0.04462 0.06693 0.04462 0.011156];
A=[2.31064 -5.47438 5.345781 -2.43516 0.43285];
freqz(B,A,256,10000);title('magnitude and phase plot for LPF
DT Butterworth filter -using BLT method ');
```

Output

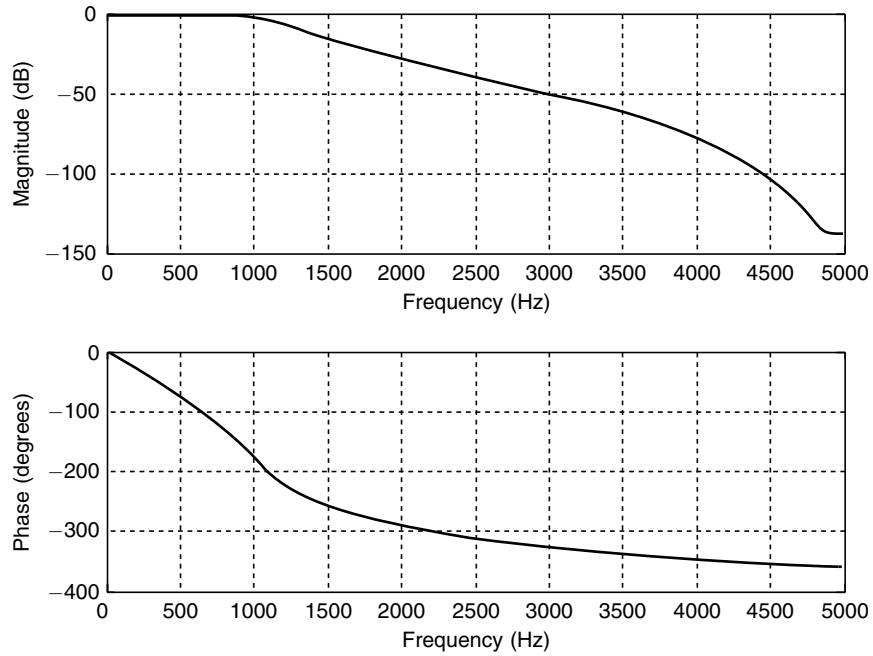

Figure 8 Magnitude and phase plot for LPF DT Butterworth filter using BLT.

Program 8

Write a program to design DT Butterworth filter for the following specifications using BLT method.

$$0.8 \le |H(e^{j\omega})| \le 1 \quad \text{for} \quad 0 \le \omega \le 0.2\pi$$
$$|H(e^{j\omega})| \le 0.2 \quad \text{for} \quad 0.6\pi \le \omega \le \pi$$

```
%magnitude and phase plot
clear all;
B=[0.1406 0.2812 0.1406];
A=[1.6709 -1.7188 0.6103];
freqz(B,A,256,1);title('magnitude and phase plot for LPF DT
Butterworth filter -using BLT method ');
```

Output

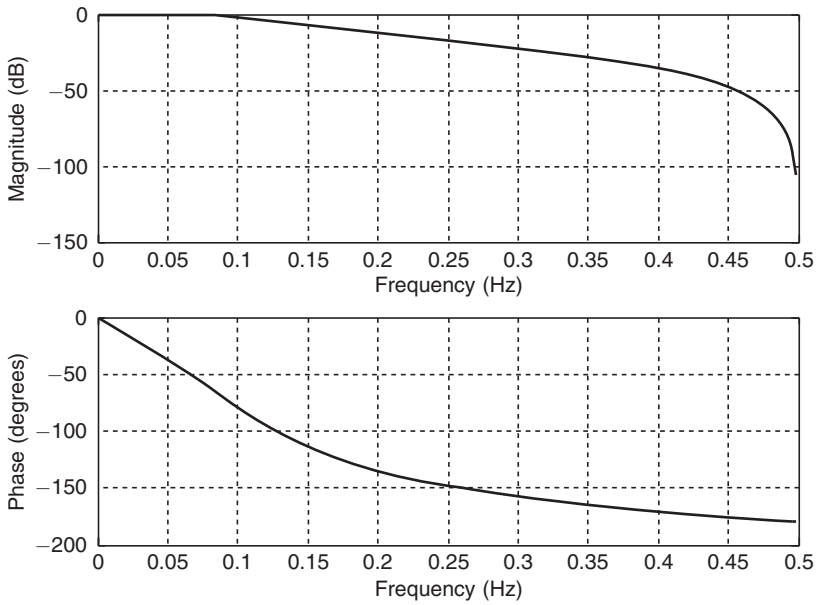

Figure 9 Magnitude and phase plot.

Program 9

Write a program to plot magnitude and phase of Chebyshev filters.

```
%magnitude and phase plot for chebyshev filter
clear all;
B=[0.01685 0.05055 0.05055 0.01685];
A=[1.46864 -3.1400 2.59872 -0.79256];
freqz(B,A,256,10000);title('magnitude and phase plot for LRF
DT Chebyshev filter -using BLT method ');
```

Output

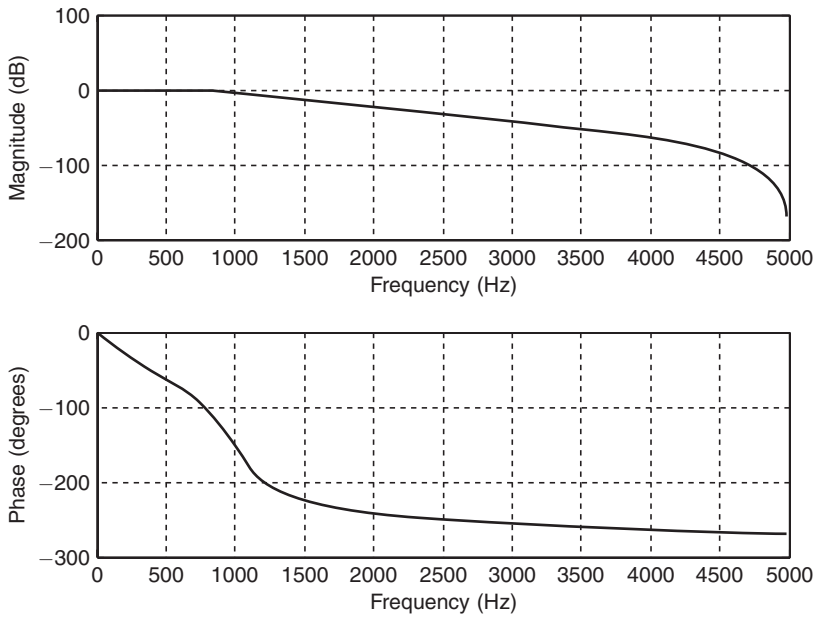

Figure 10 Magnitude and phase response for LPF DT Chebyshev filter using BLT method.

Program 10

Write a program to find the impulse response for echo filter.

```
%impulse response for echo filter
clear all;
Q=20;a0=1;b1=0.25;
a=[1];
b=[1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.25];
freqz(b,1,256,10000);title('magnitude and phase plot for FIR
filter –echo filter ');
```

Output

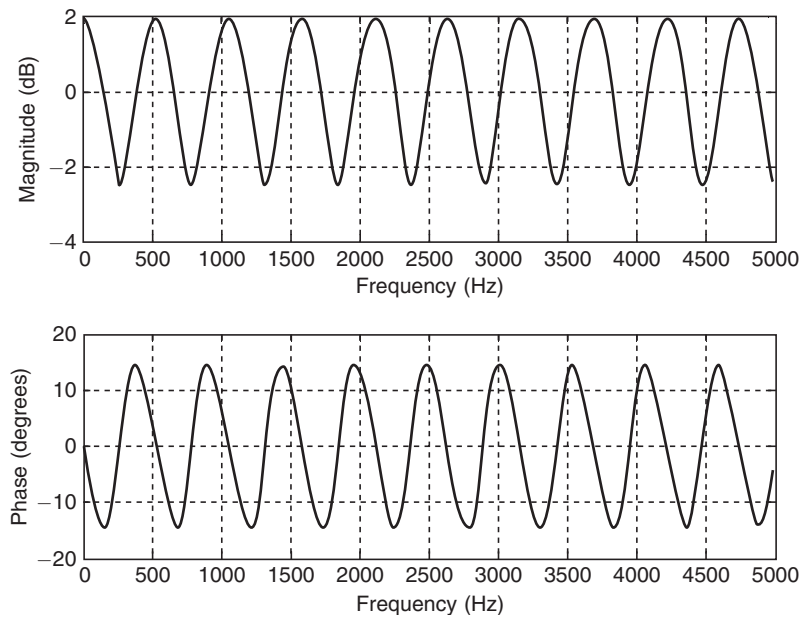

Figure 11 Magnitude and phase response of the comb filter.

Program 11

Write a program to describe multiple echo generation.

```
%multiple echo generation
clear all;
Q=8;a0=1;b=0.8;N=4;
a=[1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.0000000002328 ];
b=[1 0 0 0 0 0 0 0 0.25];
freqz(b,a,256,10000);title('magnitude and phase plot for IIR filter -echo filter ');
for i=1:4:100,
x(i)=(b)^(i/4);
end
figure;
plot(x);title('impulse response of echo generator');
xlabel('sample number');ylabel('Amplitude');
```

Output

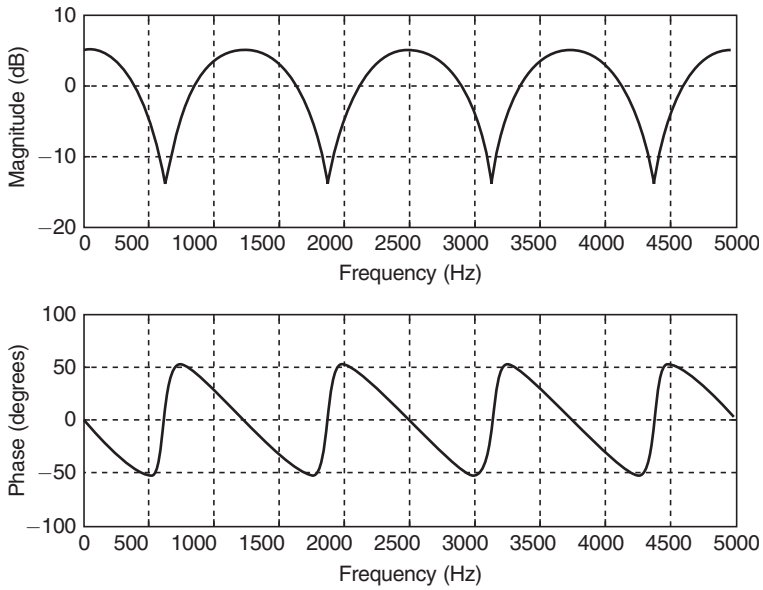

Figure 12 Magnitude and phase response of the IIR echo filter.

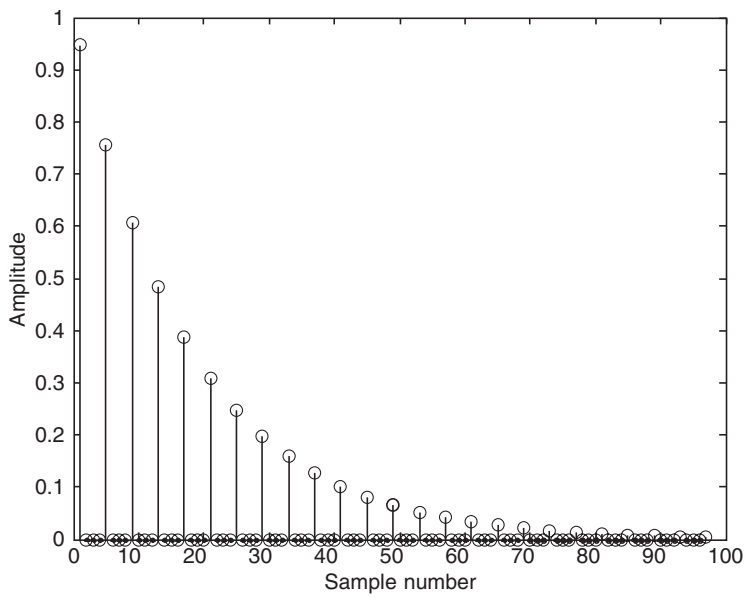

Figure 13 Impulse response of the IIR echo filter or echo generator.

Program 12

Write a program to plot magnitude and phase of IIR filter used for synthesis of plucked string tones of Chebyshev filters.

```
%Magnitude and phase response plot of IIR filter used for
synthesis of plucked string tones
figure;
b=0.99; Q=20;
a=[1];
b=[1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -0.4089 -0.4079];
freqz(b,a,256,20000);title('magnitude response of IIR filter
for plucked string instrument');
```

Output

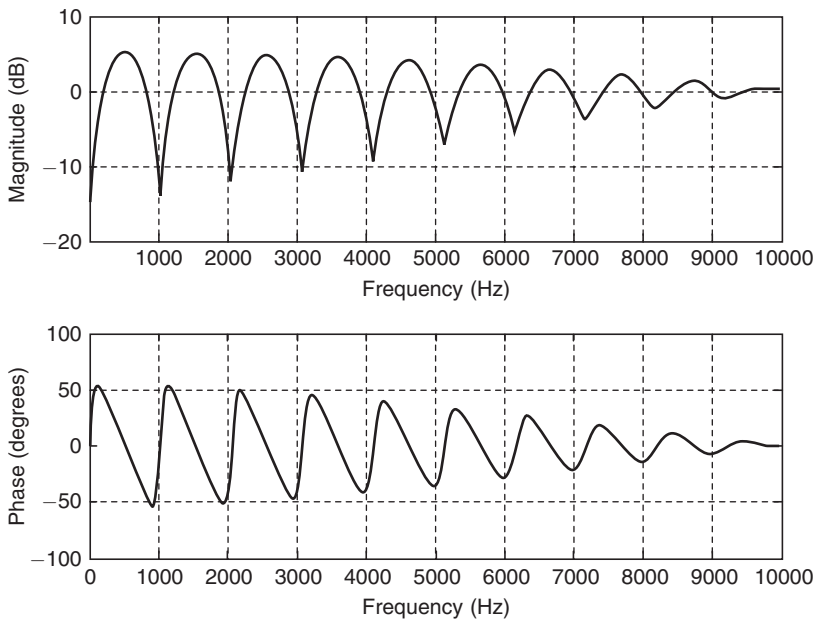

Figure 14 Magnitude and phase response plot of IIR filter used for synthesis of plucked string tones.