```
w1_1 = linspace(0, 0.22*pi, 100);
w1_2 = linspace(0.48*pi, pi, 100);

w2_1 = linspace(0, 0.22*pi, 100);
w2_2 = linspace(0.32*pi, pi, 100);

w3_1 = linspace(0, 0.10*pi, 100);
w3_2 = linspace(0.13*pi, pi, 100);

magnitude_w1_1 = linspace(0.8, 1, 100);
magnitude_w1_2 = linspace(0.32, 0.32, 100);

magnitude_w2_1 = linspace(0.8, 1, 100);
magnitude_w2_2 = linspace(0.26, 0.26, 100);

magnitude_w3_1 = linspace(0.8, 1, 100);
magnitude_w3_2 = linspace(0.22, 0.22, 100);


frequency1 = [w1_1, w1_2];
magnitude1 = [magnitude_w1_1, magnitude_w1_2];

frequency2 = [w2_1, w2_2];
magnitude2 = [magnitude_w1_1, magnitude_w1_2];

frequency3 = [w3_1, w3_2];
magnitude3 = [magnitude_w1_1, magnitude_w1_2];

filter_coefficients1 = firls(filter_order, frequency1/(pi), magnitude1);

[H1, frequency_response1] = freqz(filter_coefficients1, 1, 1024, 'whole');

filter_coefficients2 = firls(filter_order, frequency2/(pi), magnitude2);

[H2, frequency_response2] = freqz(filter_coefficients2, 1, 1024, 'whole');


filter_coefficients3 = firls(filter_order, frequency3/(pi), magnitude3);

[H3, frequency_response3] = freqz(filter_coefficients3, 1, 1024, 'whole');


load("signals4.mat");
figure;
subplot(3,1,1);
plot(frequency_response1, abs(H1));
hold on;
plot(frequency_response2, abs(H2));
plot(frequency_response3, abs(H3));
legend("H1","H2","H3");
title("Frequency responses of Filters H1,H2 and H3");
grid on;

subplot(3,1,2);
plot(x);
title("Input Signal X");
grid on;
subplot(3,1,3);
plot(y);
title("Output Signal Y");
grid on;
```
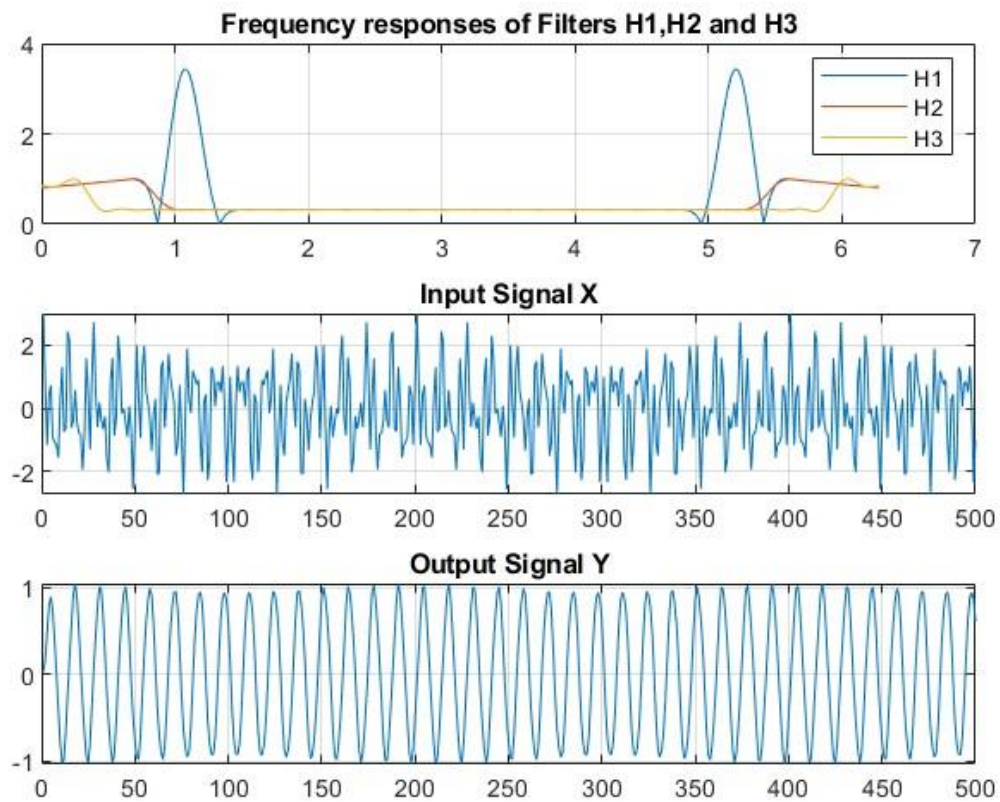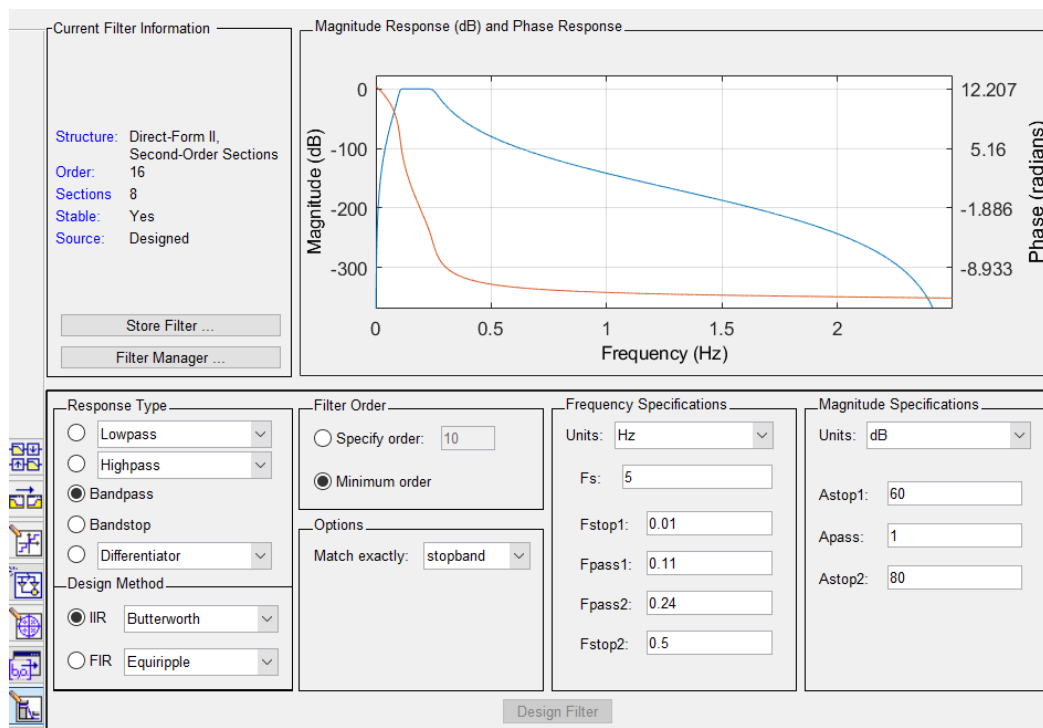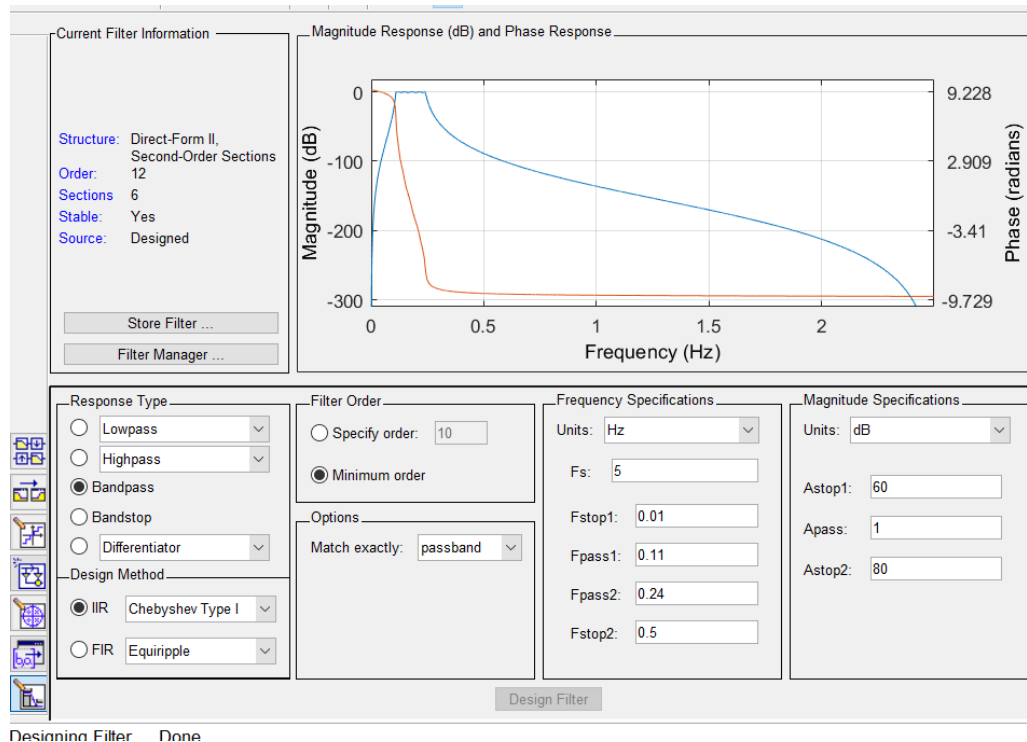
Q1)

Frequency responses of Filters H1,H2 and H3

Input Signal X

Output Signal Y

Answer is H3.

Q2)

Current Filter Information

Structure: Direct-Form II,
           Second-Order Sections
Order: 16
Sections: 8
Stable: Yes
Source: Designed

Store Filter ...

Filter Manager ...

Magnitude Response (dB) and Phase Response

Response Type
○ Lowpass
○ Highpass
● Bandpass
○ Bandstop
○ Differentiator

Design Method
● IIR   Butterworth
○ FIR   Equiripple

Filter Order
○ Specify order: 10
● Minimum order

Options
Match exactly: stopband

Frequency Specifications
Units: Hz
Fs: 5
Fstop1: 0.01
Fpass1: 0.11
Fpass2: 0.24
Fstop2: 0.5

Magnitude Specifications
Units: dB
Astop1: 60
Apass: 1
Astop2: 80

Design Filter

Q3)

Q4)

Q5)

Input filtered with Chebyshev Type I filter (y2)