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E/14/049

Lab 3: System Functions and Frequency Response

PART 1

Code :

```
clear all;
close all;

figure('name', 'Question 1');
b = [1 5];
a = [1 2 3];
zs = roots(b);
ps = roots(a);
pzmap(ps, zs);

figure('name', 'Question 2');
b = [2 5 12];
a = [1 2 10];
zs = roots(b);
ps = roots(a);
pzmap(ps, zs);

figure('name', 'Question 3');
b = [2 5 12];
a = [1 4 14 20];
zs = roots(b);
ps = roots(a);
pzmap(ps, zs);
```

Figure 1 :

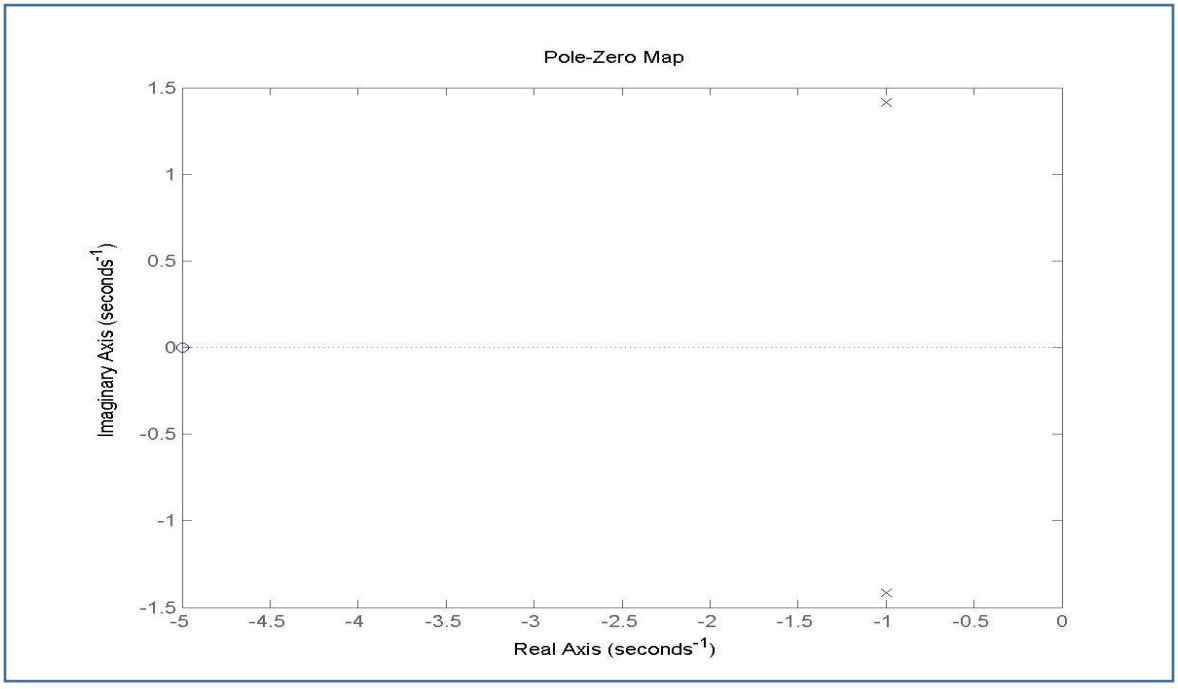


Figure 2 :

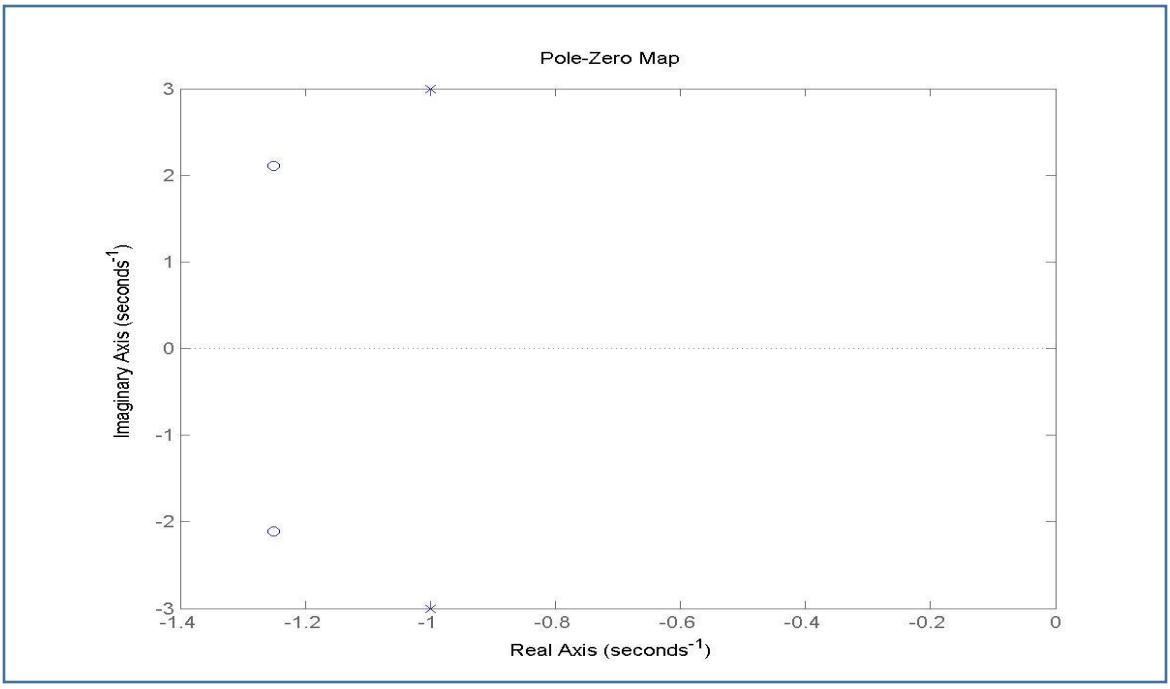
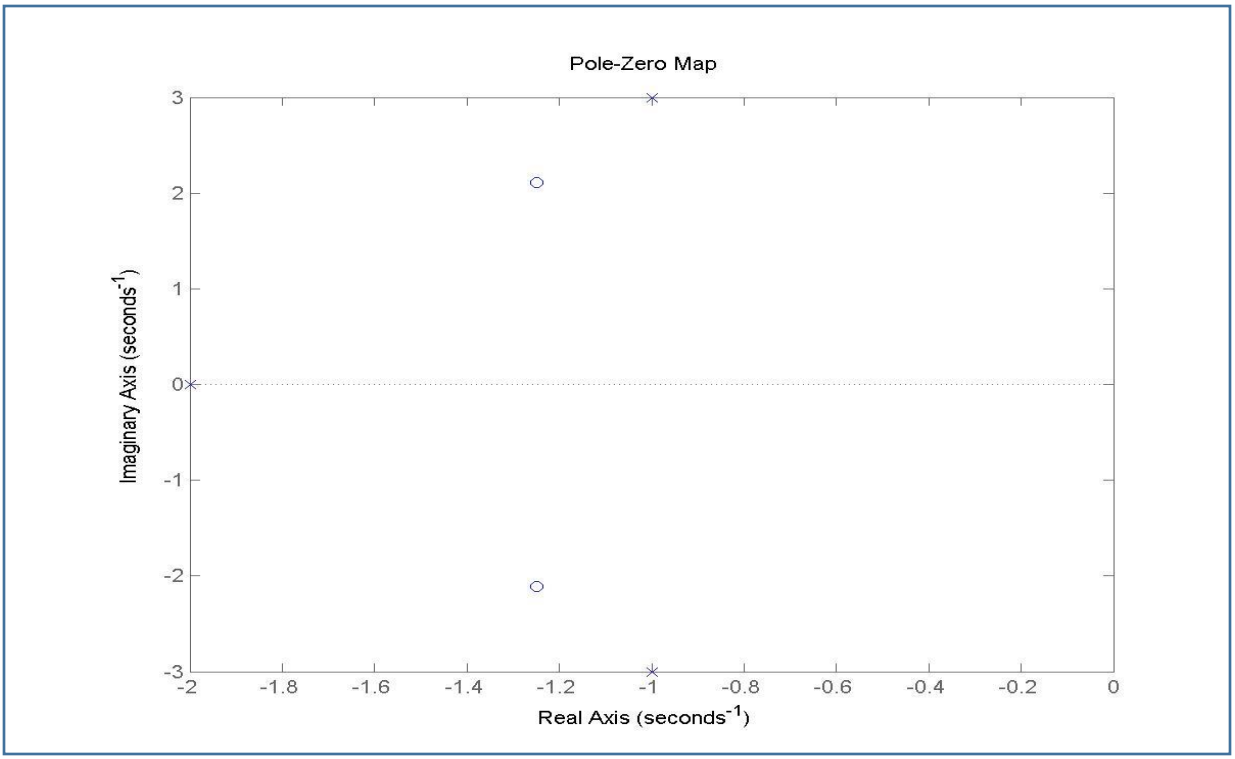


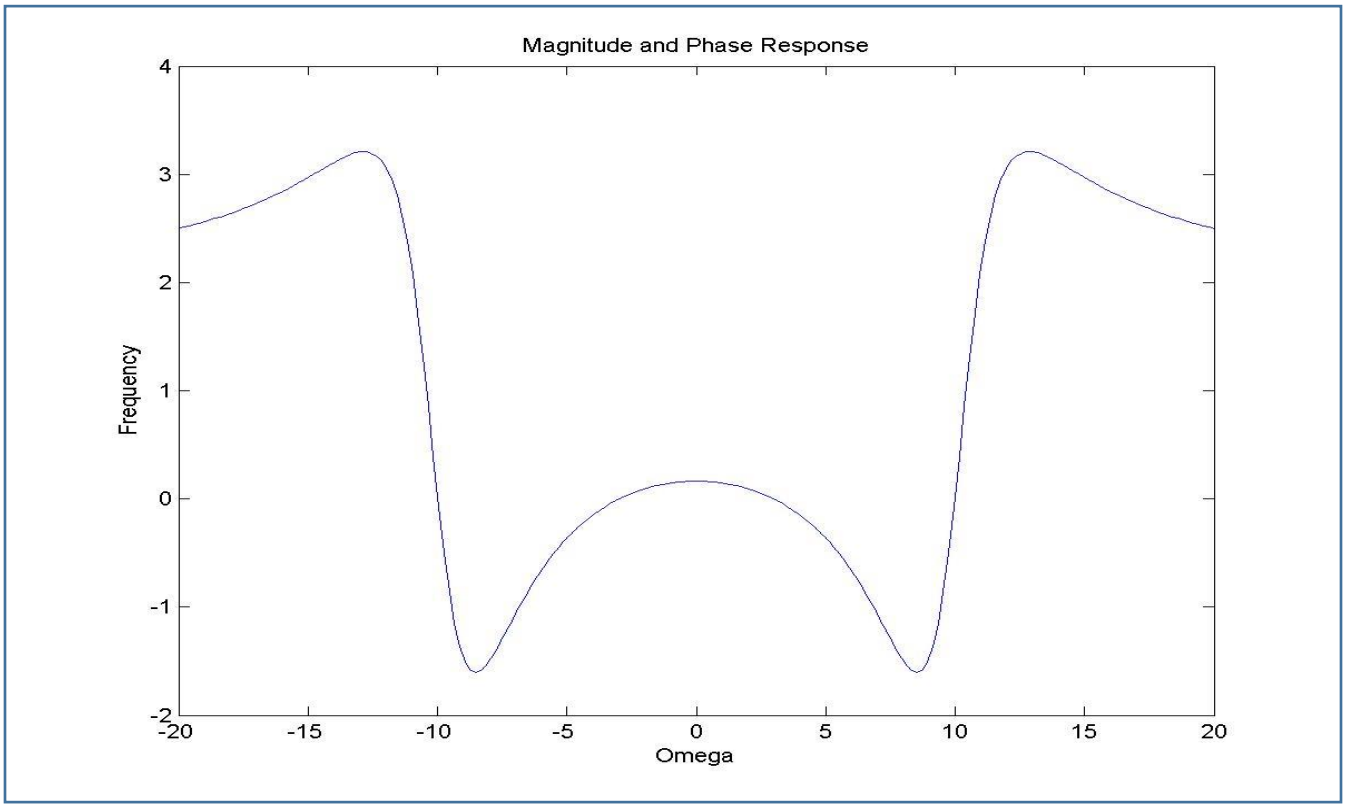
Figure 3 :

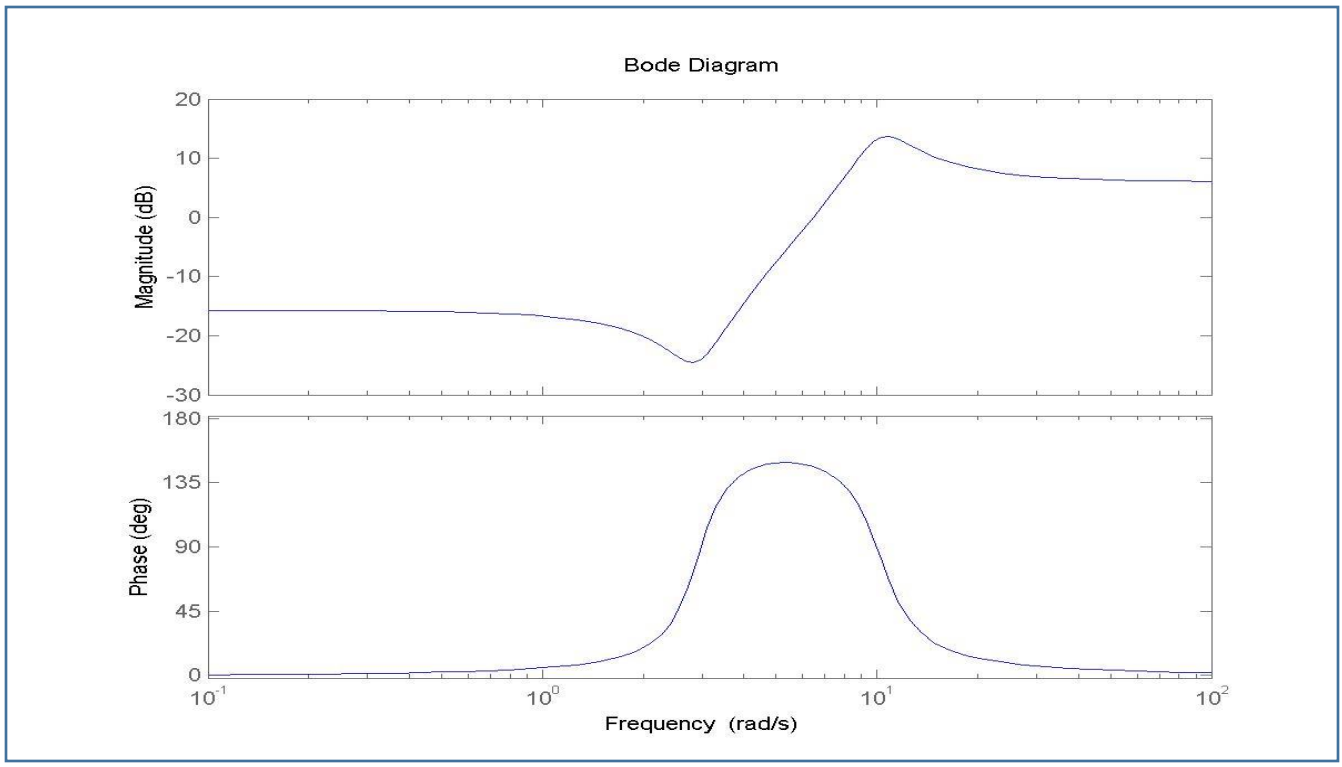


PART 2

```
clear all;
close all;

figure('name', 'Magnitude and Phase Response');
b = [2 2 17];
a = [1 4 104];

omega = linspace(-20,20,200);
H = freqs(b,a,omega);
plot(omega,H);
xlabel('Omega');
ylabel('Frequency');
title('Magnitude and Phase Response');

figure('name', 'Bode Plot');
H = tf(b,a);
bode(H);
```

figure 1 :





Exercise

1.

```
clear all;
close all;

figure('name', 'Example 1');
b = [2 2 17];
a = [1 4 104];
H = tf(b,a);
bode(H);

figure('name', 'Question 1');
b = [1 5];
a = [1 2 3];
H = tf(b,a);
bode(H);

figure('name', 'Question 2');
b = [2 5 12];
a = [1 2 10];
H = tf(b,a);
bode(H);

figure('name', 'Question 3');
b = [2 5 12];
a = [1 4 14 20];
H = tf(b,a);
bode(H);
```

Figure 1 :

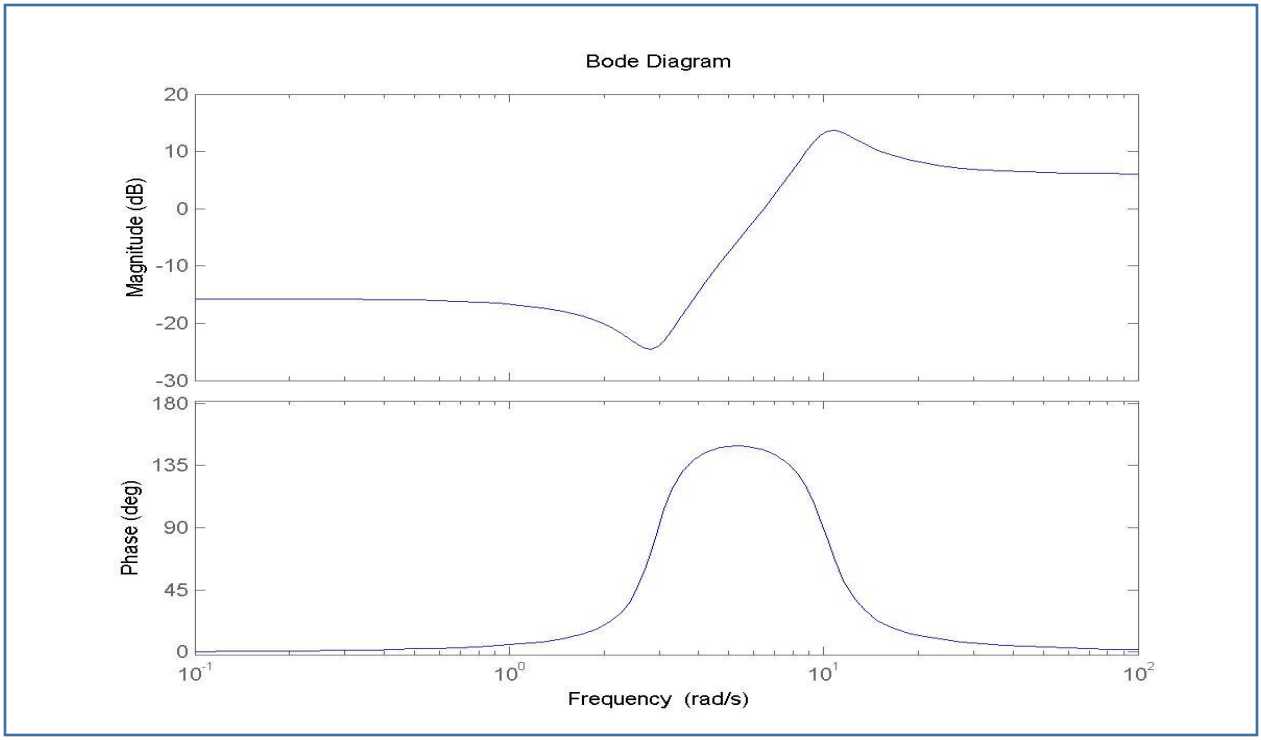


Figure 2 :

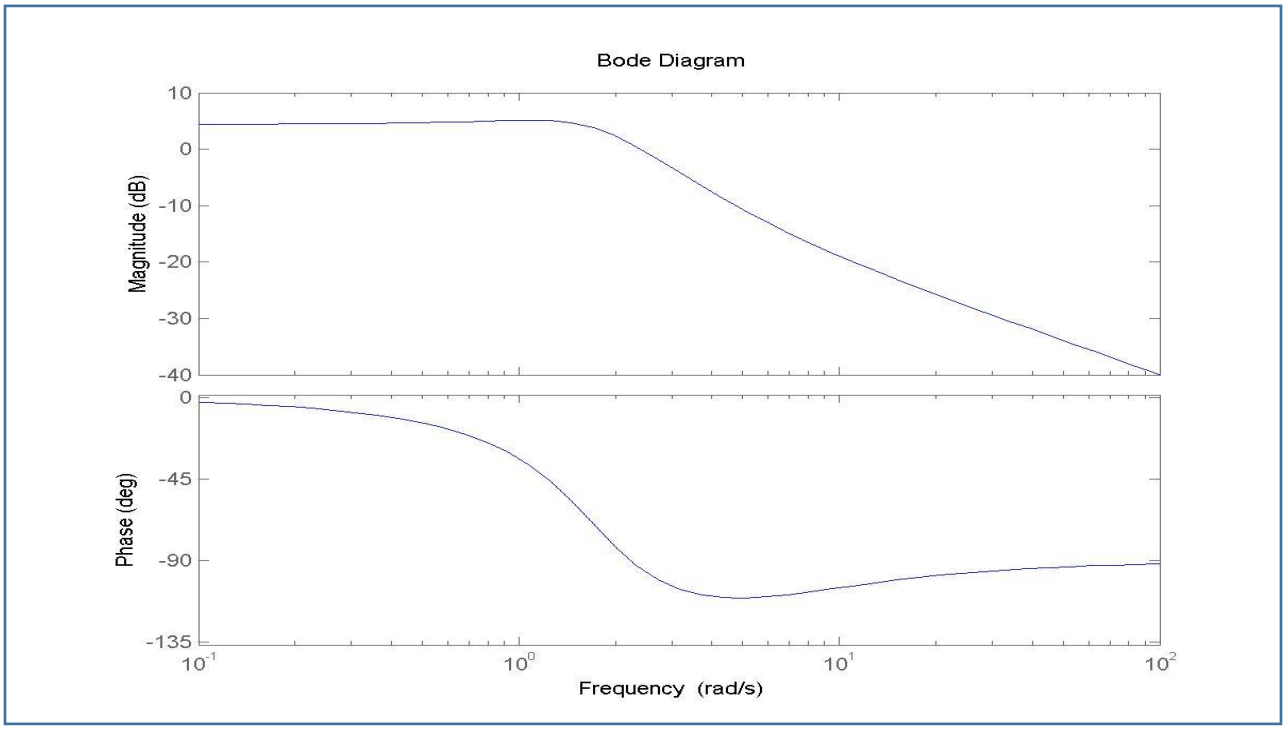


Figure 3 :

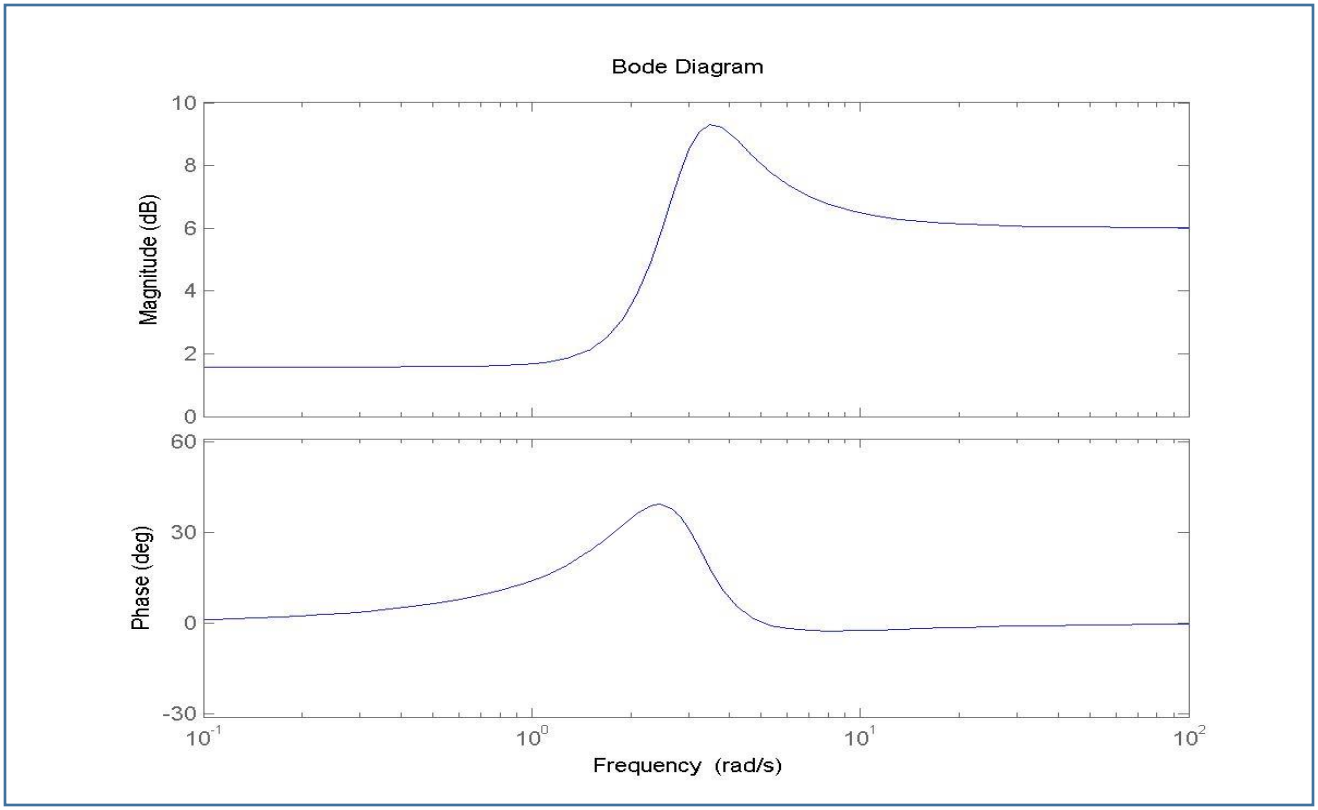
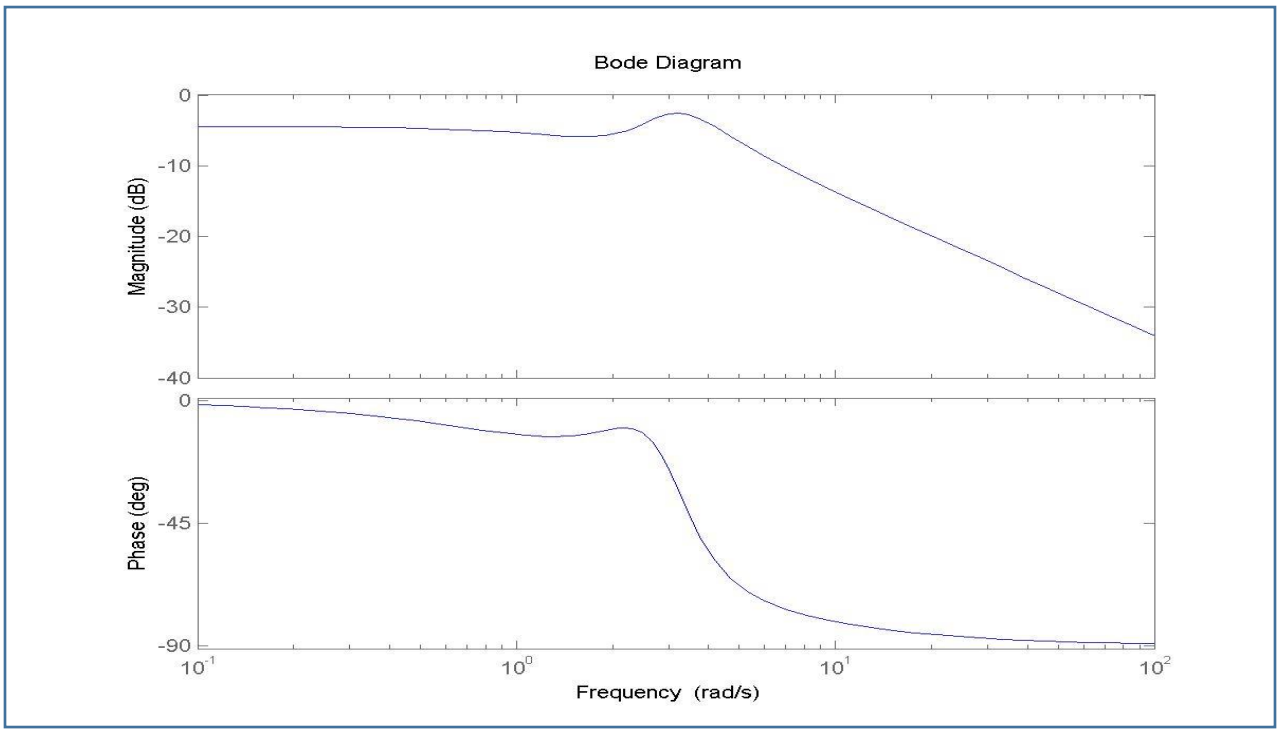


Figure 4 :



2.

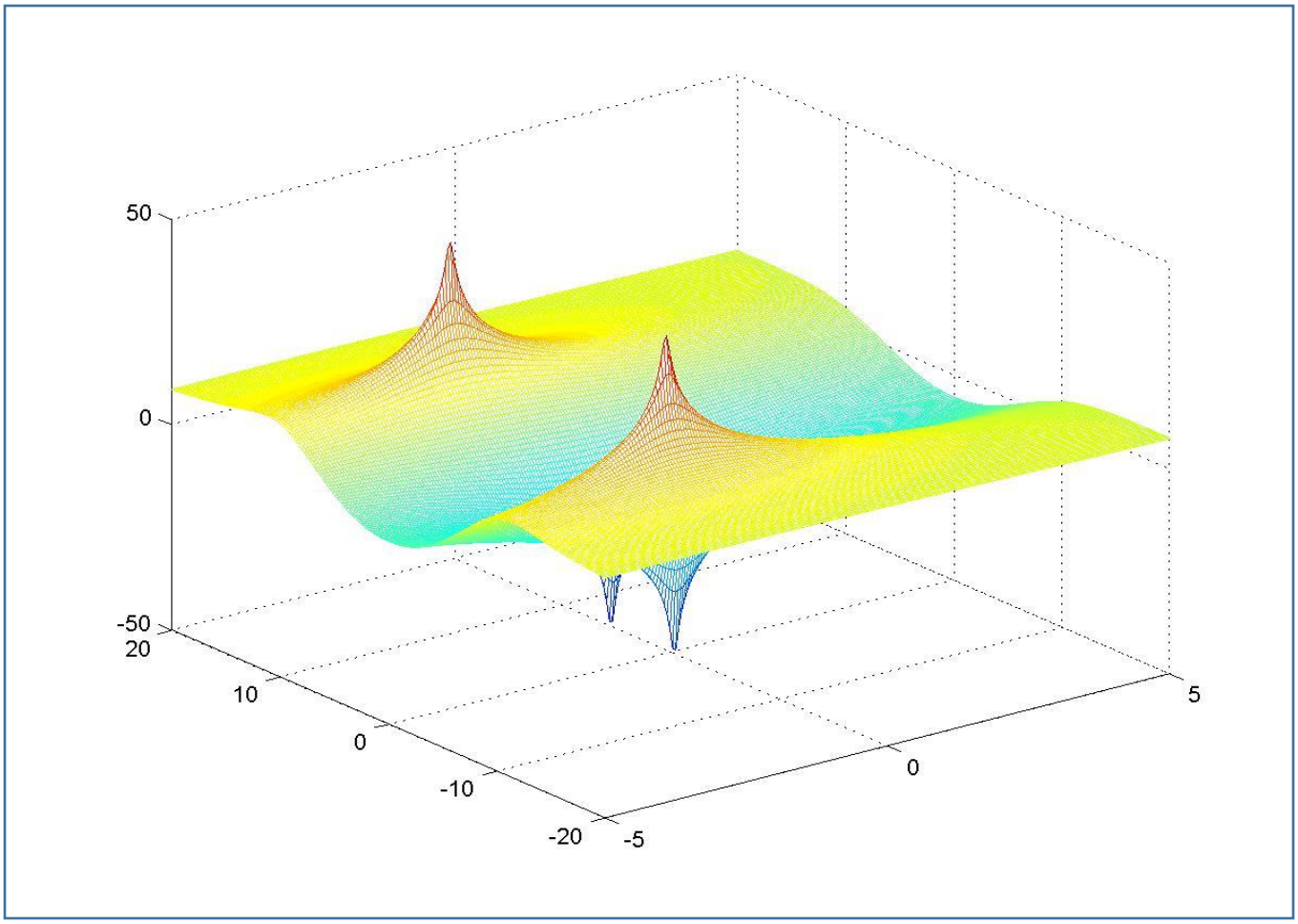
```
clear all;
close all;
syms s t;

fprintf('For 1th sinusoidal signal');
 hs = (2*s^2+2*s+17)/(s^2+4*s+104);
for i = 1:3
    fprintf('i = %d\n',i);
    xt = sin(2*pi*49*i*t*10^3);
%E/14/049
    xs = laplace(xt);
    ys = hs*xs;
    yt = ilaplace(ys);

    disp('X(t)');
    disp(xt);
    disp('X(s)');
    disp(xs);
    disp('Y(s)');
    disp(ys);
    disp('Y(t)');
    disp(yt);

end

fprintf('For 2th sinusoidal signal');
hs = (s+5)/(s^2+2*s+3);
for i = 1:3
    fprintf('i = %d\n',i);
    xt = sin(2*pi*49*i*t*10^3);
%E/14/049
    xs = laplace(xt);
    ys = hs*xs;
    yt = ilaplace(ys);

    disp('X(t)');
    disp(xt);
    disp('X(s)');
    disp(xs);
    disp('Y(s)');
    disp(ys);
    disp('Y(t)');
    disp(yt);

end
```

```
fprintf('For 3th sinusoidal signal');
 hs = (2*s^2+5*s+12)/(s^2+2*s+10);
 for i = 1:3
    fprintf('i = %d\n',i);
    xt = sin(2*pi*49*i*t*10^3);
%E/14/049
    xs = laplace(xt);
    ys = hs*xs;
    yt = ilaplace(ys);

    disp('X(t)');
    disp(xt);
    disp('X(s)');
    disp(xs);
    disp('Y(s)');
    disp(ys);
    disp('Y(t)');
    disp(yt);

end

 fprintf('For 4th sinusoidal signal');
 hs =
(2*s^2+5*s+12)/(s^3+4*s^2+14*s+20);
for i = 1:3
    fprintf('i = %d\n',i);
    xt = sin(2*pi*49*i*t*10^3);
%E/14/049
    xs = laplace(xt);
    ys = hs*xs;
    yt = ilaplace(ys);

    disp('X(t)');
    disp(xt);
    disp('X(s)');
    disp(xs);
    disp('Y(s)');
    disp(ys);
    disp('Y(t)');
    disp(yt);

end

diary output.txt
```

Outputs of these can be see the output.txt file attached with the codes.

PART 3

```
clear all;
close all;

sigma = linspace(-20, 20, 200);
omega = linspace(-5, 5, 200);
[sigmagrid, omegagrid] = meshgrid(sigma, omega);
sgrid = sigmagrid + 1i*omegagrid;

b = [2 2 17];
a = [1 4 104];
H1 = polyval(b, sgrid)./polyval(a, sgrid);
mesh(sigma, omega, 20*log10(abs(H1)));
```



We can find the Zeros by just looking at the mesh grid where they are display the zeros in blue color and pols are represent in red color.