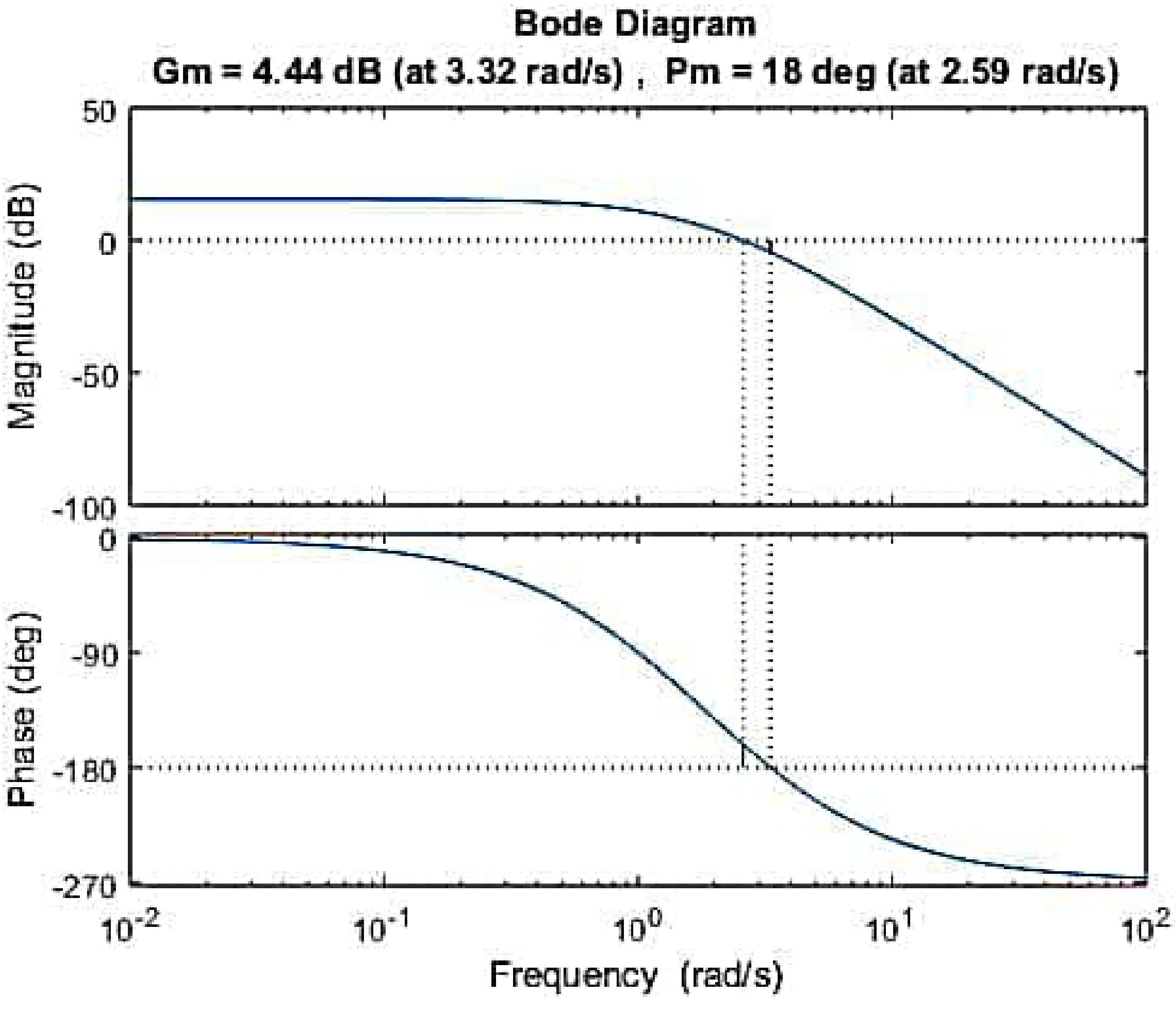
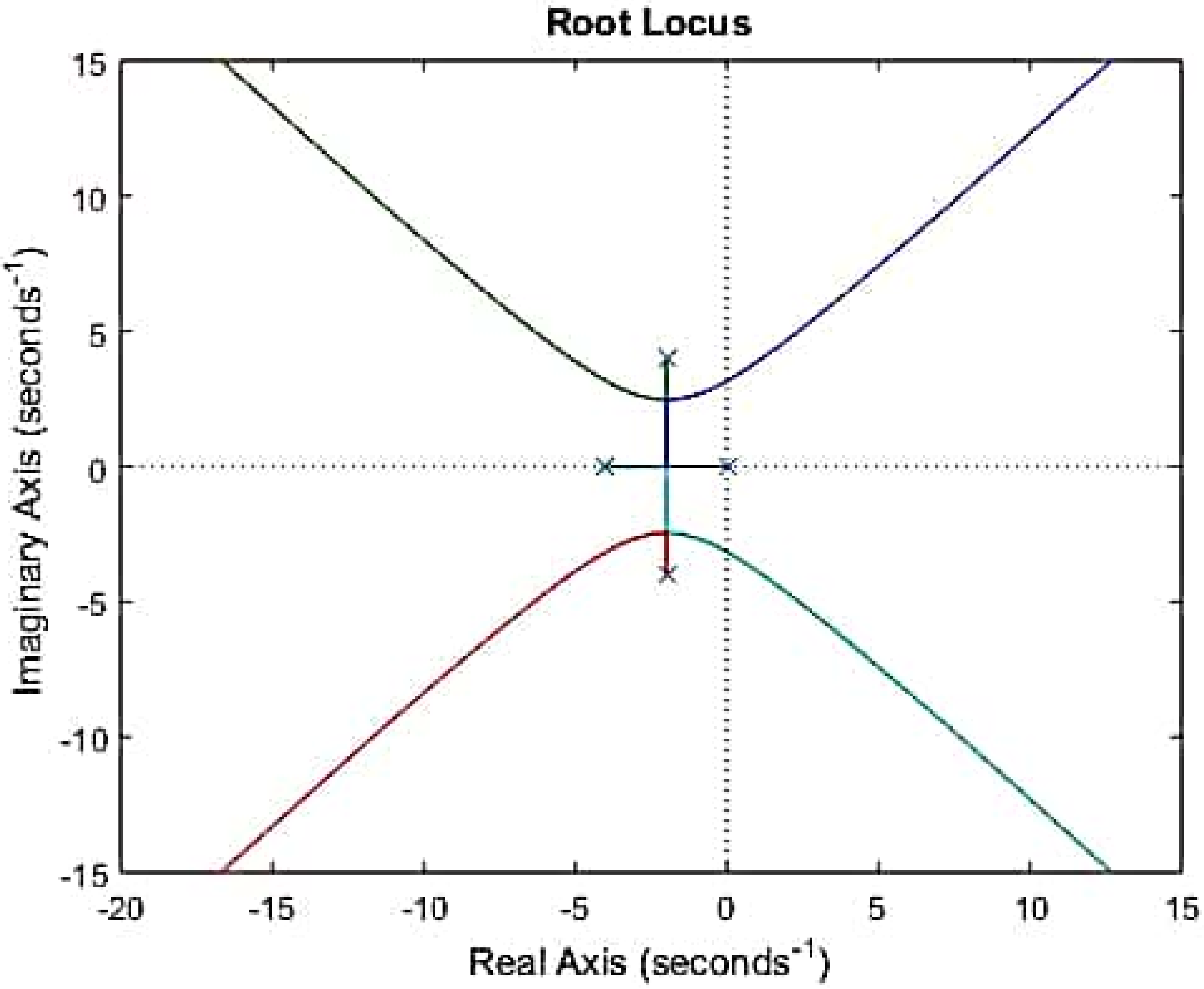
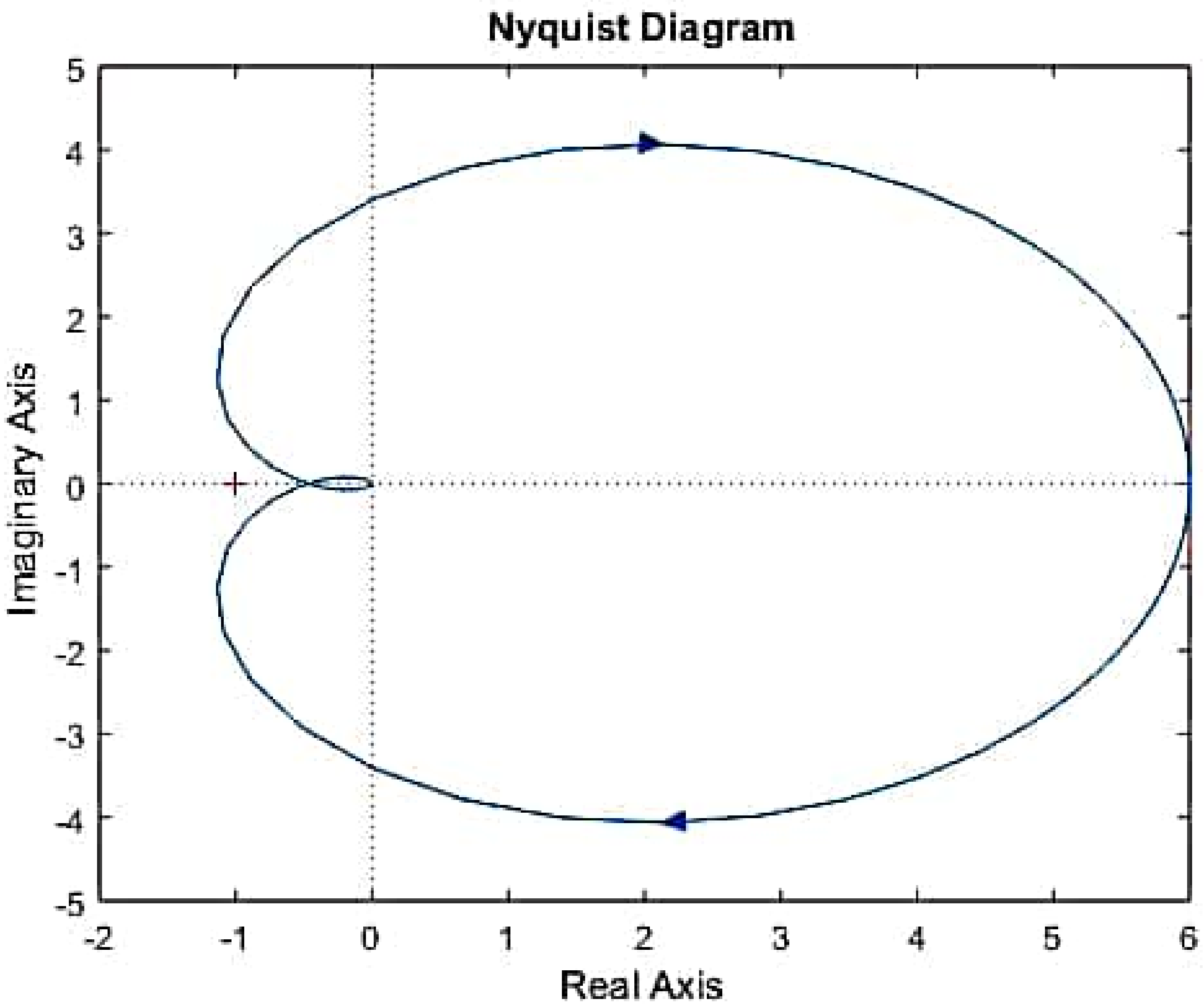


Bode Diagram
Gm = 4.44 dB (at 3.32 rad/s) , Pm = 18 deg (at 2.59 rad/s)
50
0
-50
-100
Magnitude (dB)
0
-90
-180
-270
Phase (deg)
10^-2
10^-1
10^0
10^1
10^2
Frequency (rad/s)

```
%% BODE PLOT
%% Transfer function: 36/(s^3+6s^2+11s+6).
num = [0 36];
den = [1 6 11 6];
sys = tf(num,den);
bode(sys)
margin(sys)
```

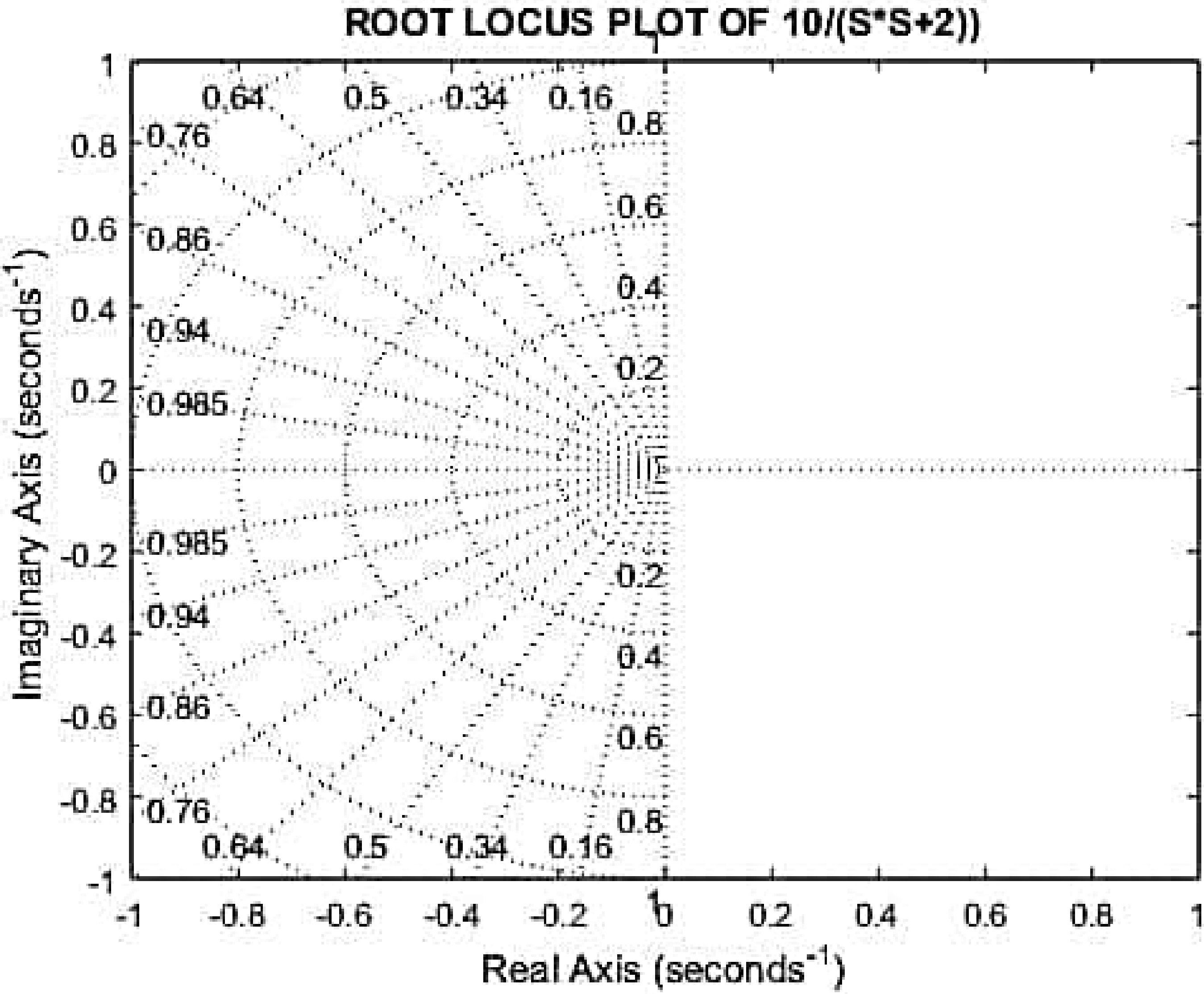


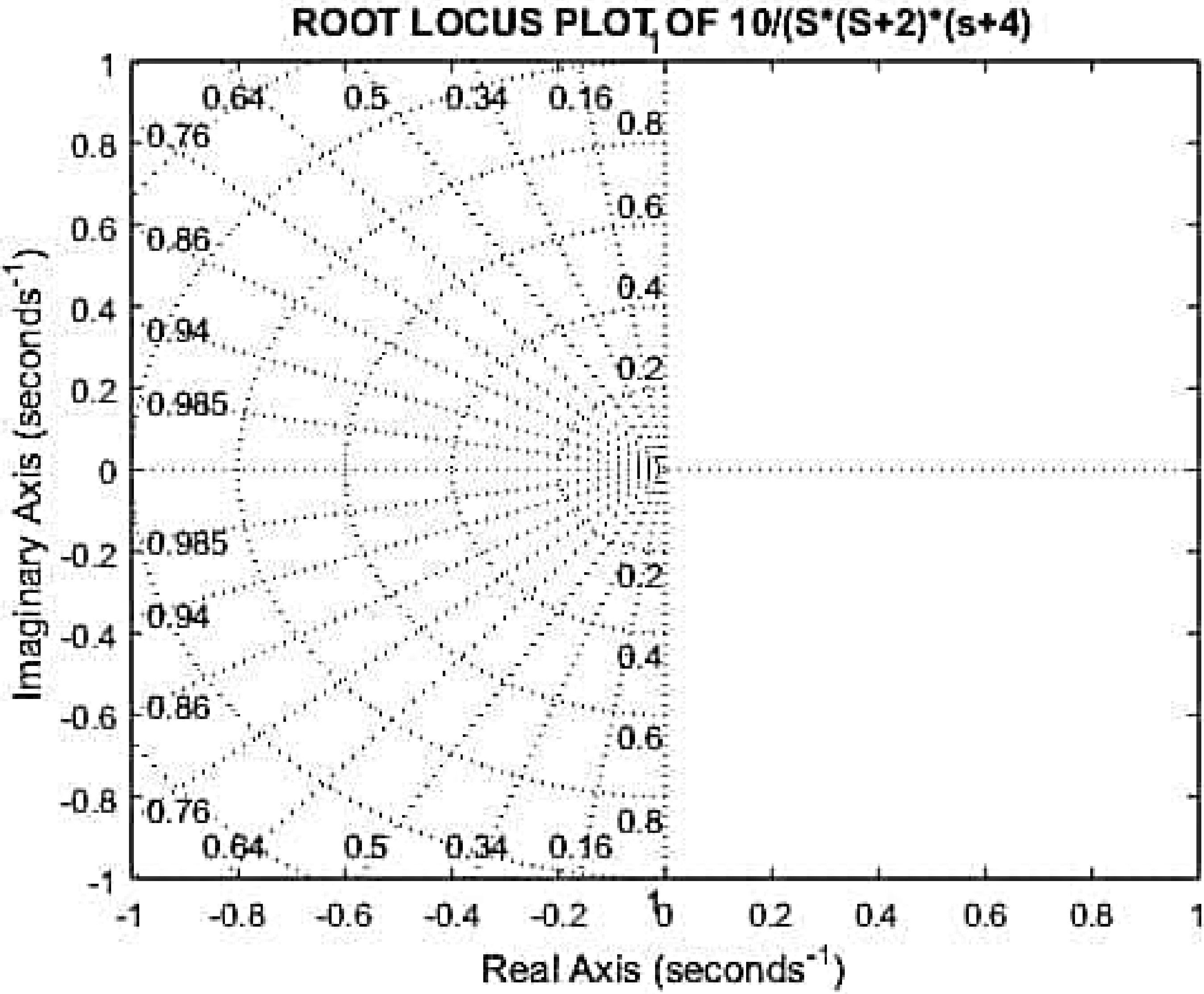
Root Locus
15
10
5
0
-5
-10
-15
Imaginary Axis (seconds^{-1})
-20
-15
-10
-5
0
5
10
15
Real Axis (seconds^{-1})

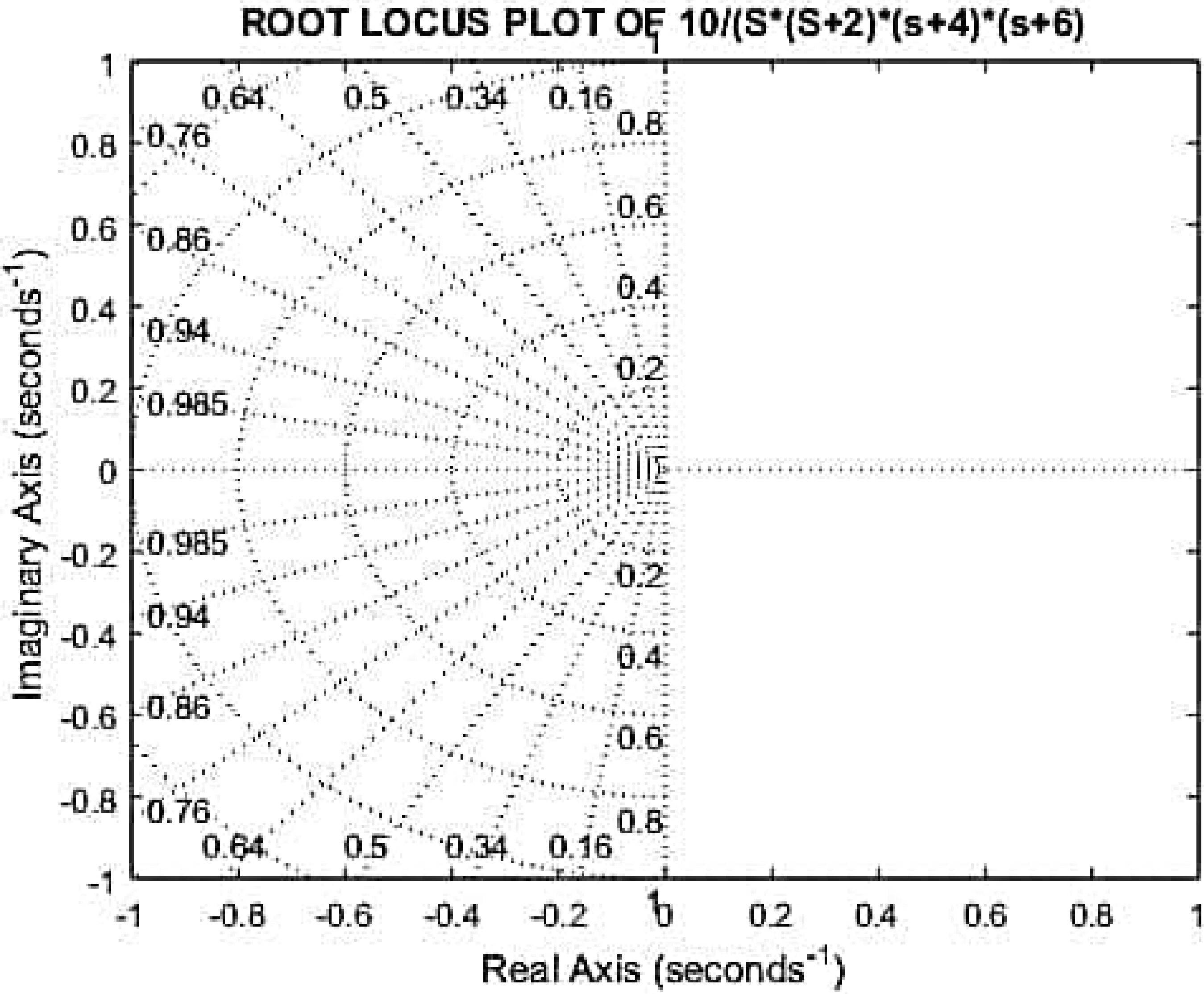

Nyquist Diagram
Imaginary Axis
Real Axis
5
4
3
2
1
0
-1
-2
-3
-4
-5
-2
-1
0
1
2
3
4
5
6

```
%Program for root locus:
% Given ; G(s)H(s)=10/(s^4+8*s^3+36*s^2+80*s)
%Program :
p = [0 0 0 0 10];
q = [1 8 36 80 0];
sys=tf(p,q);
zpk(sys)
rlocus(sys)
```

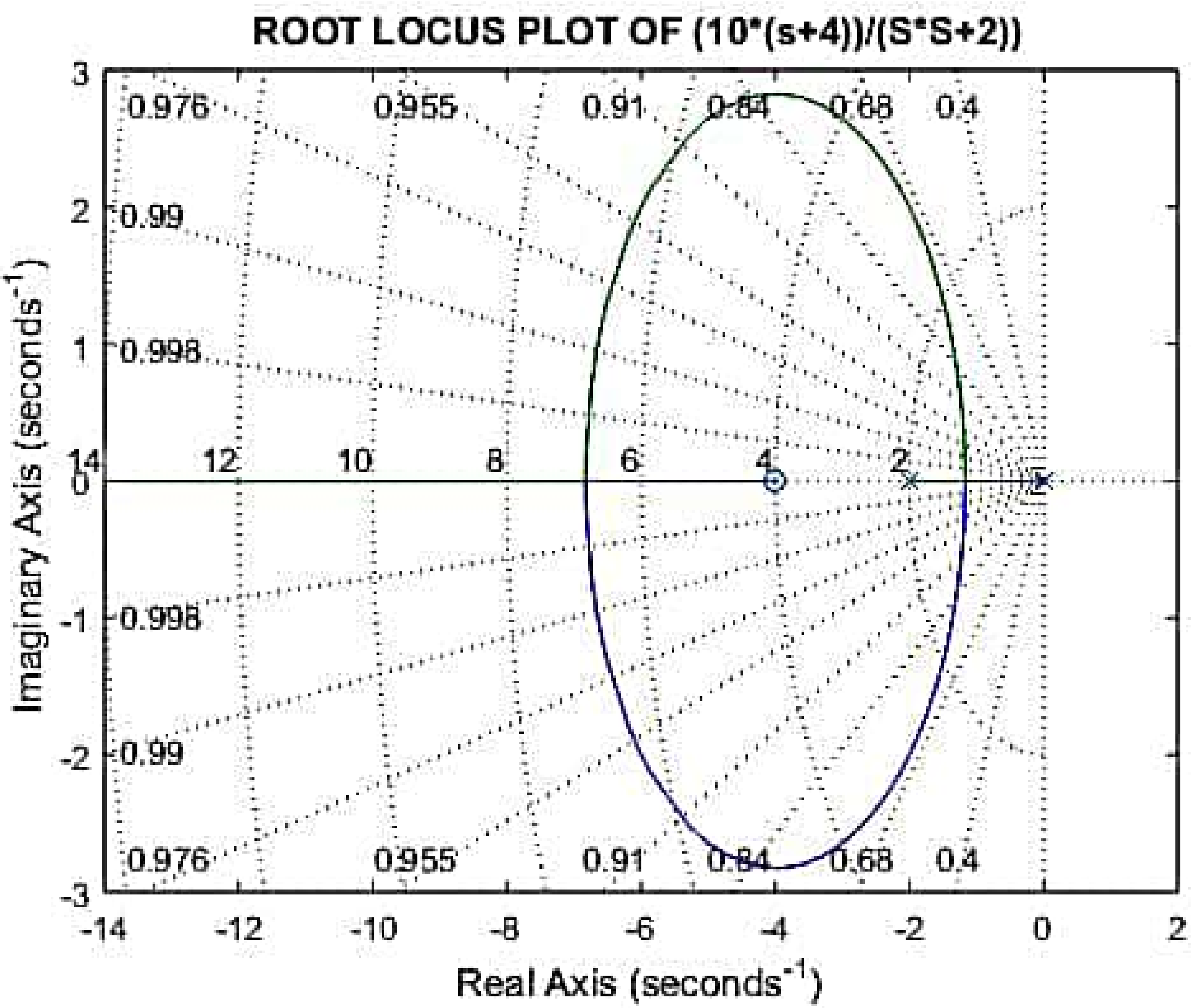
```
%Program for Nyquist plot:
% Given the T.F: 60/(s+1)(s+2)(s+5)
%Programme:
p = [0 60];
q = [1 8 17 10];
sys = tf(p,q);
nyquist(sys)
```

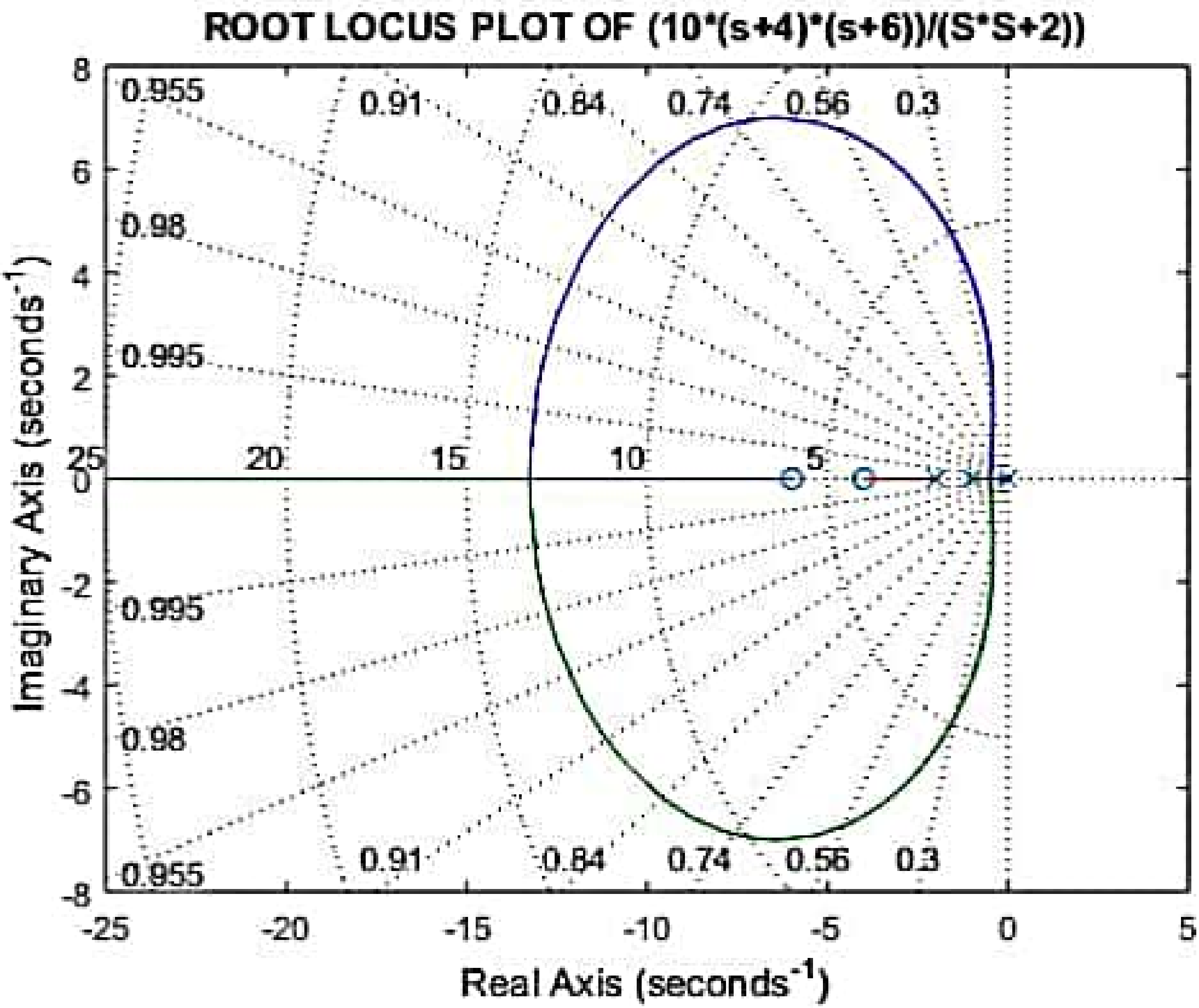

ROOT LOCUS PLOT OF 10/(S*S+2))
Imaginary Axis (seconds^{-1})
Real Axis (seconds^{-1})
0.64
0.5
0.34
0.16
0.76
0.86
0.94
0.985
0.8
0.6
0.4
0.2
1
0
-0.2
-0.4
-0.6
-0.8
-1


ROOT LOCUS PLOT OF 10/(S*(S+2)*(s+4)
Imaginary Axis (seconds^-1)
Real Axis (seconds^-1)
0.64
0.5
0.34
0.16
0.76
0.86
0.94
0.985
0.8
0.6
0.4
0.2
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1

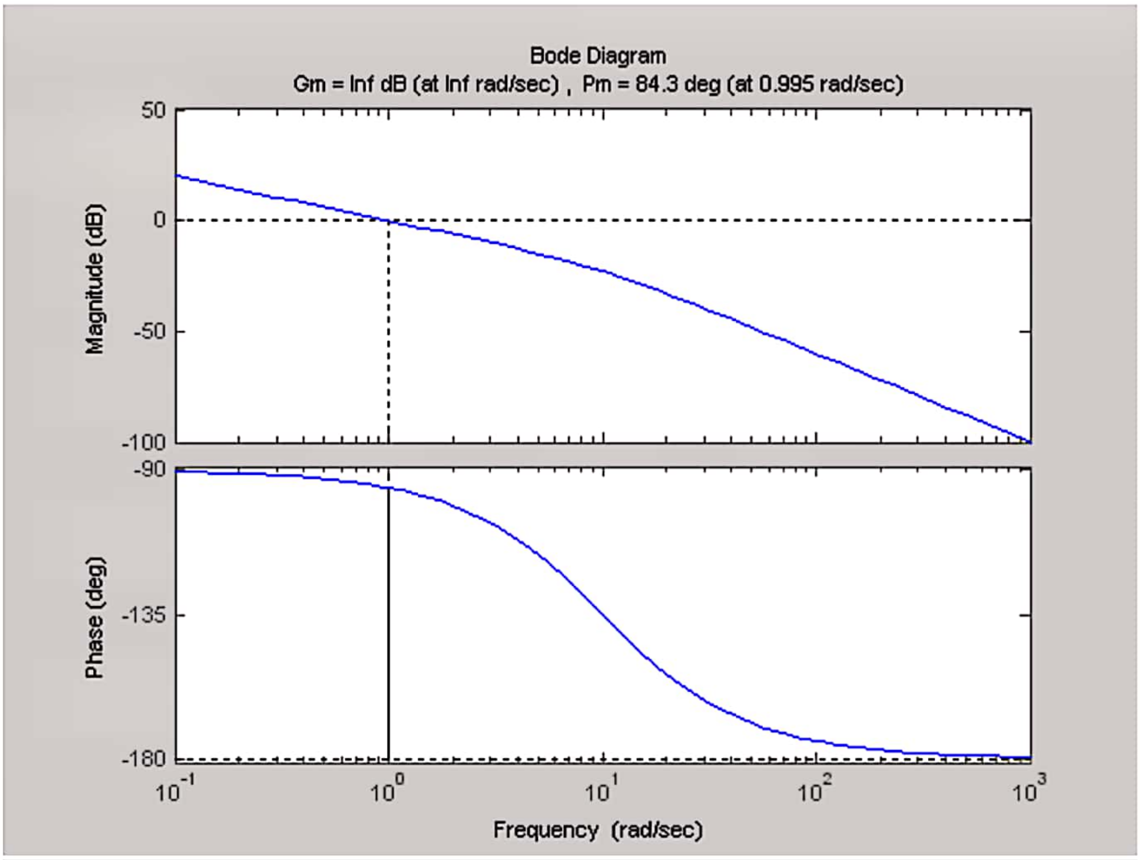


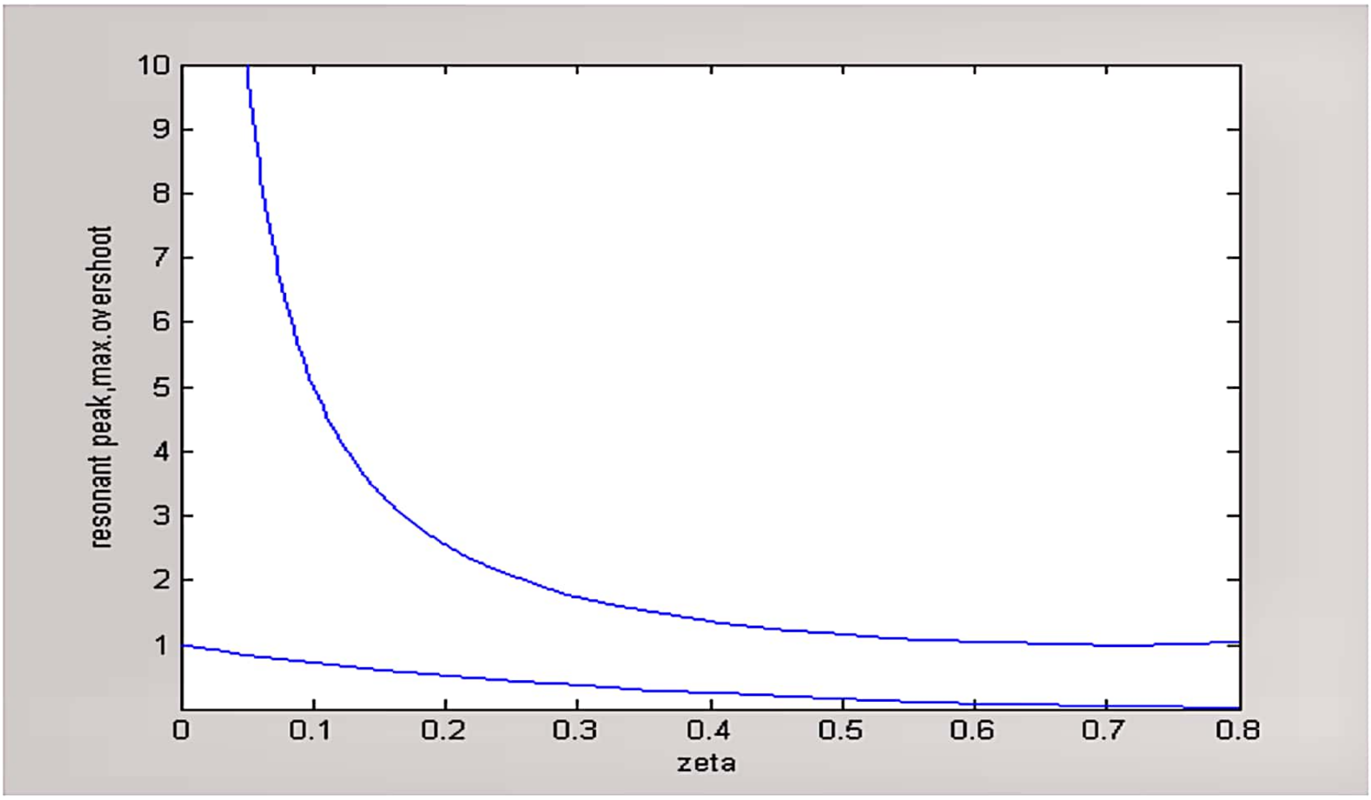
ROOT LOCUS PLOT OF 10/(S*(S+2)*(s+4)*(s+6)
Imaginary Axis (seconds^-1)
Real Axis (seconds^-1)
0.64
0.5
0.34
0.16
0.76
0.86
0.94
0.985
0.8
0.6
0.4
0.2
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1


ROOT LOCUS PLOT OF (10*(s+4))/(S*S+2))
Imaginary Axis (seconds-1)
Real Axis (seconds-1)
0.976
0.955
0.91
0.84
0.68
0.4
0.99
0.998
14
12
10
8
6
4
2
3
2
1
0
-1
-2
-3
-14
-12
-10
-8
-6
-4
-2
0
2

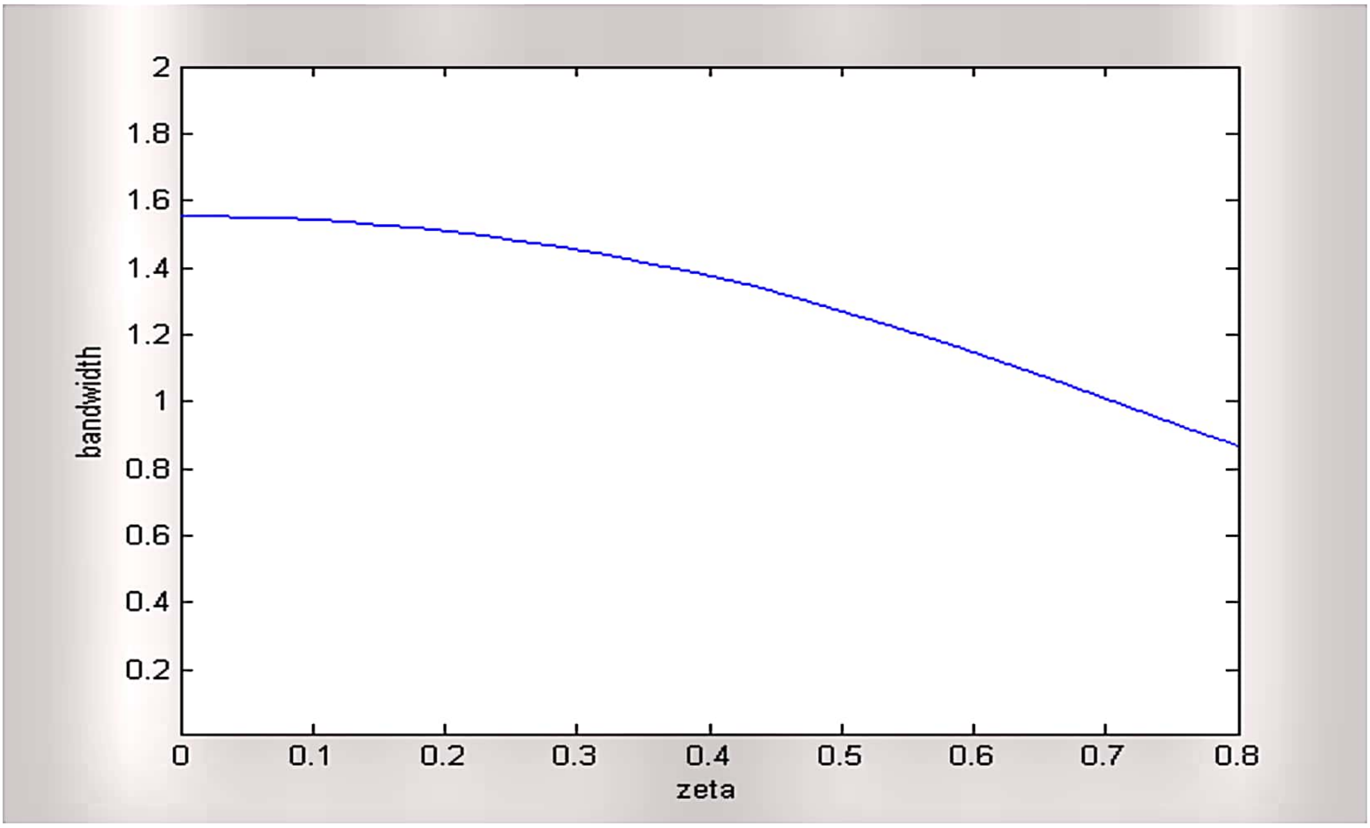

ROOT LOCUS PLOT OF (10*(s+4)*(s+6))/(S*S+2))
Imaginary Axis (seconds^{-1})
Real Axis (seconds^{-1})
0.955
0.91
0.84
0.74
0.56
0.3
0.98
0.995
25
20
15
10
5
8
6
4
2
0
-2
-4
-6
-8
-25
-20
-15
-10
-5
0
5

```
% RELATIONSHIP BETWEEN FREQUENCY RESPONSE AND TRANSIENT RESPONSE
clc;
s=poly(0,'s');
F=syslin('c',(1/(0.1*s^2+s)));
fmin=0.1;
fmax=100;
bode(F,fmin,fmax); %% Plot s frequency response of open loop
show_margin(OL) %% Display GM,PM,Cross over frequency
```


Bode Diagram
Gm = Inf dB (at Inf rad/sec) , Pm = 84.3 deg (at 0.995 rad/sec)
50
0
-50
-100
Magnitude (dB)
-90
-135
-180
Phase (deg)
10-1
100
101
102
103
Frequency (rad/sec)



resonant peak,max.overshoot
zeta
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
1
2
3
4
5
6
7
8
9
10



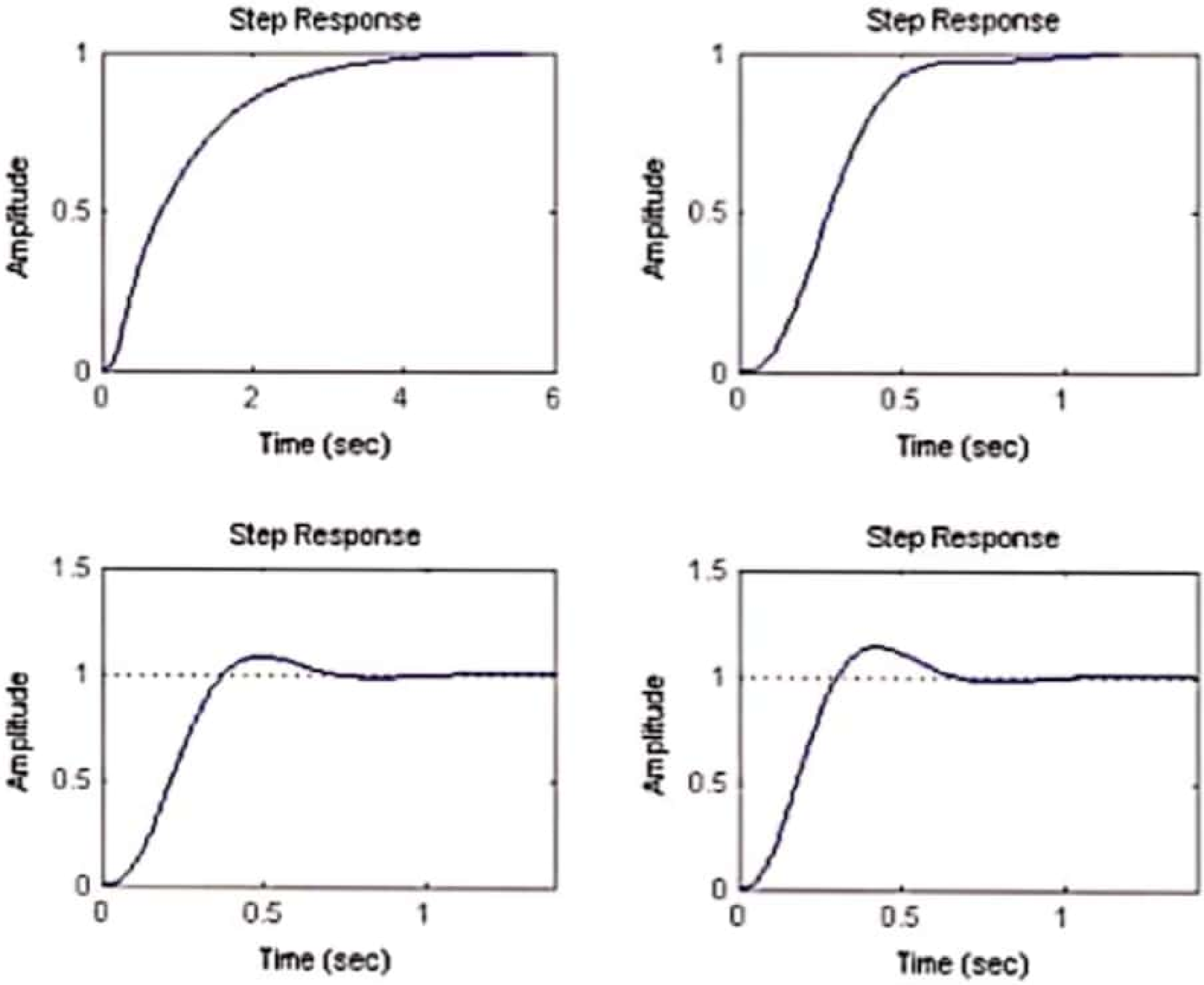
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
bandwidth
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
zeta

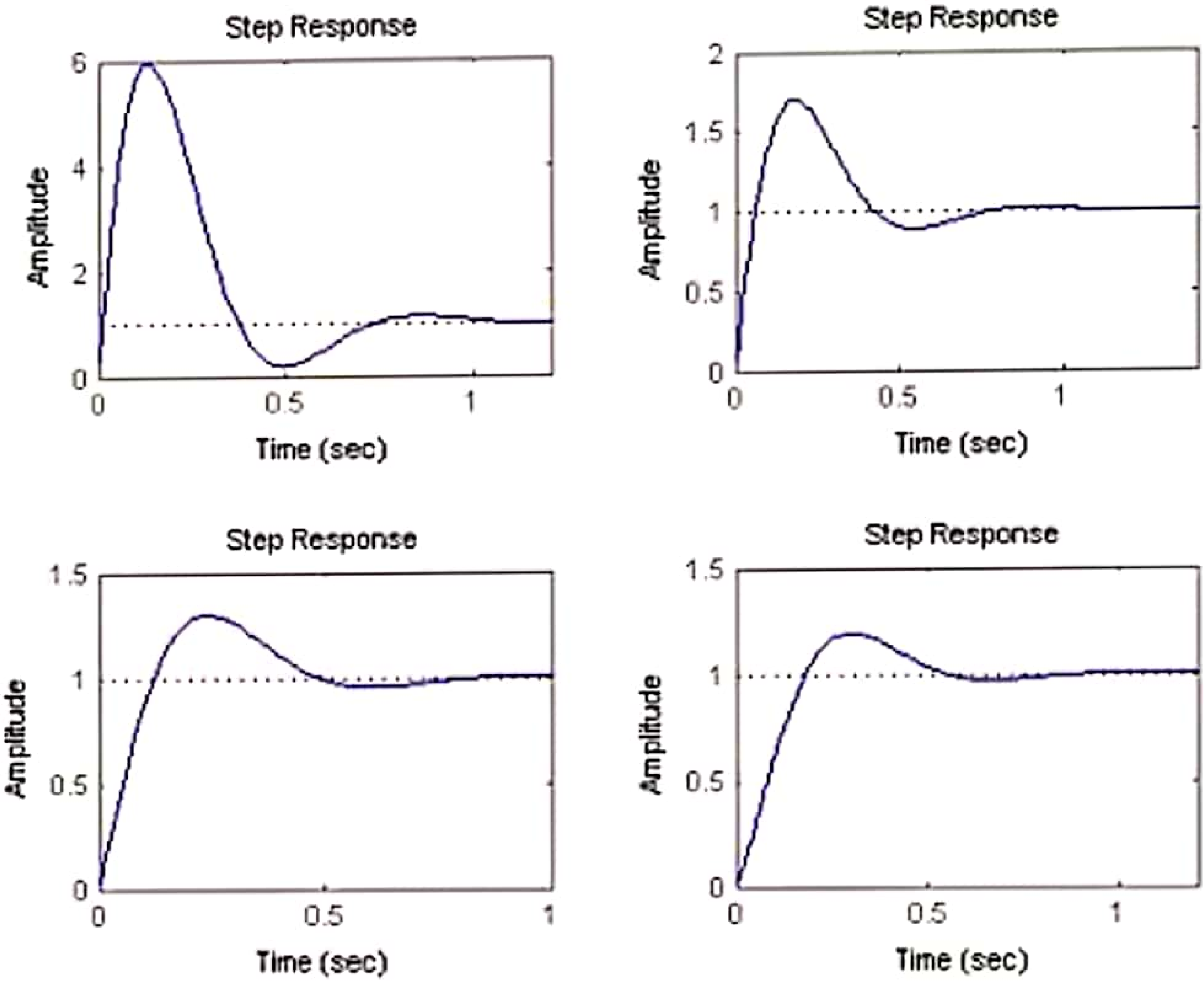
```
% Effect of addition of poles to closed loop TF
p=[1 5 10 20];
wn=input('Enter value of wn=');
zeta=input('enter value of zeta=');
S=tf('s');
for i=1:4
    num= wn^2*p(i);
    den=[1 p(i)+2*zeta*wn wn^2+2*zeta*wn*p(i) p(i)*wn^2];
    G=tf(num,den);
    subplot(2,2,1)
    figure(i)
    step(G)
    stepinfo(G)

end

% Effect of addition of zeros to closed loop TF
p=[1 5 10 20];
wn=input('Enter value of wn=');
zeta=input('enter value of zeta=');
s=tf('s');
for i=1:4
    num= [wn^2 wn^2*z(i)];
    den=[z(i) 2*zeta*wn*z(i)  z(i)*wn^2];
    G=tf(num,den);
    subplot(2,2,1)
    figure(i)
    step(G)
    stepinfo(G)

end
```


Step Response
Amplitude
Time (sec)
Step Response
Amplitude
Time (sec)
Step Response
Amplitude
Time (sec)
Step Response
Amplitude
Time (sec)


Step Response
Amplitude
Time (sec)
0
2
4
6
0.5
1
Step Response
Amplitude
Time (sec)
0
0.5
1
1.5
2
Step Response
Amplitude
Time (sec)
0
0.5
1
1.5
Step Response
Amplitude
Time (sec)
0
0.5
1
1.5