EXPERIMENT 11.

SYATEM ANALYSIS : ROOT LOCUS,BODE PLOT AND NYQUIST PLOT

ROOT LOCUS.

1.)unity feedback CS having forward path gain G(s)= K(s+3)/(s^2+4s+6)

1. Rootlocus
2. Show the roots and breakaway plot
3. Comment on the stability .

n=[1 3];

d=[2 4 6];

rlocus(n,d);



Obtain the root locus plot for the system having OLTF GH = k(s+2)/(s(s+1)(s+3)(s+5))and obtain the frequency of sustained oscillation .

n=[1,2];

d1=conv([1 0],[1 1])

d2=conv([1 3],[1 5])

d=conv(d1,d2)

sys=tf(n,d)

rlocus(sys)

d1 = 1 1 0

d2 = 1 8 15

d = 1 9 23 15 0

sys =

s + 2

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s^4 + 9 s^3 + 23 s^2 + 15 s



BODE PLOT

1. OBTAIN THE BODE PLOT WHOSE OLTF IS GH= 5/(S(S+2+(S^2+2S+25))

n=5;

d=conv([1 2 0],[1 2 10]);

sys=tf(n,d)

bode(sys);

grid;

figure;

margin(sys)

[Gm,Pm,wcg,wcp]=margin(sys);

GM\_dB=20\*log10(Gm)

display(Pm);

display(wcg);

display(wcp);

d1 =

1 1 0

d2 =

1 8 15

d =

1 9 23 15 0

sys =

s + 2

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s^4 + 9 s^3 + 23 s^2 + 15 s

Continuous-time transfer function.

>> bode1

sys =

5

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s^4 + 4 s^3 + 14 s^2 + 20 s

Continuous-time transfer function.

GM\_dB = 19.0848

Pm = 80.0220

wcg =2.2361

wcp = 0.2493



Unity feedback TF is G(s)= 200(s+3)/(s(s+2)(s^2+4s+60))

I obtain the bode plot for the frequency range of 0.01 to 100 rad/s.

II determine the pole zero plot and roots of chareacteristic equation

III comment on stability .

n1=[200 600];

d1=conv([1 2 0],[1 4 60])

olsys=tf(n1,d1)

[n2,d2]=feedback(n1,d1,1,1);

clsys=tf(n2,d2)

p=roots(d2)

pzmap(clsys);

figure;

bode(olsys,[0.01,100]);

grid;

[GM,PM,wcg,wcp]=margin(olsys)

GM\_dB=20\*log10(GM)

d1 =

1 6 68 120 0

olsys =

200 s + 600

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s^4 + 6 s^3 + 68 s^2 + 120 s

Continuous-time transfer function.

clsys =

200 s + 600

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s^4 + 6 s^3 + 68 s^2 + 320 s + 600

Continuous-time transfer function.

p =-0.1467 + 7.4497i

-0.1467 - 7.4497i

-2.8533 + 1.6326i

-2.8533 - 1.6326i

GM = 1.0915

PM = 16.0863

wcg = 7.5089

wcp = 6.9288

GM\_dB =0.7606



For the frequency range of 0.1 to 100.

n1=[200 600];

d1=conv([1 2 0],[1 4 60])

olsys=tf(n1,d1)

[n2,d2]=feedback(n1,d1,1,1);

clsys=tf(n2,d2)

p=roots(d2)

pzmap(clsys);

figure;

bode(olsys,[0.1 100]);

grid;

[GM,PM,wcg,wcp]=margin(olsys)

GM\_dB=20\*log10(GM)

d1 = 1 6 68 120 0

olsys = 200 s + 600

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s^4 + 6 s^3 + 68 s^2 + 120 s

clsys = 200 s + 600

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s^4 + 6 s^3 + 68 s^2 + 320 s + 600

Continuous-time transfer function.

p = -0.1467 + 7.4497i

-0.1467 - 7.4497i

-2.8533 + 1.6326i

-2.8533 - 1.6326i

GM = 1.0915

PM =16.0863

wcg = 7.508

wcp = 6.9288

GM\_dB = 0.7606



NYQUIST PLOT

1. Obtain the nyquist plot for the control system having the following OLTF GH= (s62+5)/((s+2)(s+5))

n=[1 0 5];

d=[1 7 10];

nyquist(n,d);

grid;

title('1MS17EC021');



b.) obtain the nyquist plot and investigate the stability of the control system having the following OLTF for i. k=i.i;

ii. k =2.5

GH = k(s+1)/((s-2)(s+0.5))

k1=1.1;

k2=2.5;

n1=[k1 k1];

d=conv([1 0.5],[1 -2]);

sys1=tf(n1,d);

n2=[k2 k2];

sys2=tf(n2,d);

nyquist(sys1,sys2);

legend('sys1','sys2')



Assignment

n=10;

d=conv([0.25 1 0],[0.5 1]);

sys=tf(n,d)

bode(sys);

grid;

figure;

margin(sys)

[Gm,Pm,wcg,wcp]=margin(sys);

GM\_dB=20\*log10(Gm)

display(Pm);

display(wcg);

display(wcp);

sys =

10

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0.125 s^3 + 0.75 s^2 + s

Continuous-time transfer function.

GM\_dB =

-4.4370

Pm =

-12.9919

wcg =

2.8284

wcp =

3.6040

