**DESIGN OF LEAD COMPENSATOR**

**MATLAB PROGRAM**

%INPUTTING THE GIVEN DATA

n1=input('enter the value of numerator');

d1=input('enter the value of denominator');

KV=input('enter the value of velocity error constant');

PM=input('enter the value of phase margin');

E=input('enter the value of epsilon');

%DETERMINATION OF K

sys=tf(n1,d1);

n2=conv([1,0],n1);

sys1=tf(n2,d1);

k=KV/dcgain(sys1)

%BODE PLOT OF UNCOMPENSATED SYSTEM

sysn=tf(n1\*k,d1)

figure(1)

margin(sysn)

title('Bode plot of uncompensated system');

w=logspace(-1,3,1000);

[mag,ph]=bode(sysn,w);

[GM,pm]=margin(sysn)

mag=reshape(mag,1000,1);

magdb=20\*log10(mag);

ph=reshape(ph,1000,1);

%DESIGN OF COMPENSATOR

phim=PM-pm+E

A=(1-sin(phim\*pi/180))/(1+sin(phim\*pi/180))

h=-20\*log10(1/sqrt(a))

wm=interp1(magdb,w,h)

T=1/(wm\*sqrt(a))

nc=[T 1]

dc=[(a\*T),1]

Gc=tf(nc,dc)

figure(2)

margin(Gc)

title('Bode Plot of Compensator');

%BODE PLOT OF COMPENSATED SYSTEM

ncd=conv(nc,n1\*k);

dcd=conv(dc,d1);

Gcd=tf(ncd,dcd)

ncd1=conv(nc,ncd);

dcd1=conv(dc,dcd);

Gcd1=tf(ncd1,dcd1)

figure(3)

margin(Gcd1)

title('Bode Plot of Compensated system');

%[mag1,ph1]=bode(Gcd,w);

[gm,PM1]=margin(Gcd1);

n3=conv([1 0],ncd1)

Gcd2=tf(n3,dcd1)

nkv=dcgain(Gcd2)

if(nkv>=kv&&PM1>=pm)

fprintf('the design is acceptable');

else

fprintf('the design is rejected');

end

OUTPUT

enter the value of numerator:1

enter the value of denominator:[1 1 0]

enter the value of velocity error constant:12

enter the value of phase margin:40

enter the value of epsilon:5

k =

12

sysn =

12

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s^2 + s

Continuous-time transfer function.

GM =

Inf

pm =

16.4230

phim =

28.5770

A =

0.3529

h =

-4.5239

wm =

4.4393

T =

0.3792

nc =

0.3792 1.0000

dc =

0.1338 1.0000

Gc =

0.3792 s + 1

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0.1338 s + 1

Continuous-time transfer function.

Gcd =

4.55 s + 12

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0.1338 s^3 + 1.134 s^2 + s

Continuous-time transfer function.

Gcd1 =

1.726 s^2 + 9.101 s + 12

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0.01791 s^4 + 0.2855 s^3 + 1.268 s^2 + s

Continuous-time transfer function.

n3 =

1.7256 9.1010 12.0000 0

Gcd2 =

1.726 s^3 + 9.101 s^2 + 12 s

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0.01791 s^4 + 0.2855 s^3 + 1.268 s^2 + s

Continuous-time transfer function.

nkv =

12

the design is acceptable>>