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```

%32# #####
clc
% num0=25; ##### 21.6367#####=22.977dB,#####=56.2352#
num0=20000;   ###K##Wc=593.7126#####=-35.0848dB,#####=-58.4549#
den0=conv([1,0],conv([0.0265,1],[0.00318,1]));

figure
bode(num0,den0) #####
grid on
[Gm0,Pm0,Wcg0,Wcp0]=margin(num0,den0)
r0=Pm0; #####G0#####
disp(['####Wc',Wcp0])
disp(['#####=' ,num2str(20*log10(Gm0)), 'dB, ', '####=' ,num2str(Pm0), '#']);

% ####
% numc1=conv([1/254.1],[1,9.6]);
% denc1=[1,0.0378];
numc1=[0.1042,1];
denc1=[26.455,1];
[numg1,deng1]=series(num0,den0,numc1,denc1);

figure
bode(numg1,deng1) #####
grid on
[Gm0,Pm0,Wcg0,Wcp0]=margin(numg1,deng1)
r0=Pm0; #####G0#####
disp(['####Wc',Wcp0])
disp(['#####=' ,num2str(20*log10(Gm0)), 'dB, ', '####=' ,num2str(Pm0), '#']);
% #####Wc=48.616
% #####=10.1157dB,#####=17.9047#

% ####
numc2=[0.028447,1];
denc2=[0.006472,1];
[numg2,deng2]=series(numg1,deng1,numc2,denc2);
G12=tf(numg2,deng2) ;
% [z,p,k]=tf2zp(numg2,deng2) ;
%z###p#####

figure
bode(numg2,deng2) #####
title('#####Bode#')
grid on
[Gm0,Pm0,Wcg0,Wcp0]=margin(numg2,deng2)
r0=Pm0; #####G0#####
disp(['####Wc',Wcp0])
disp(['#####=' ,num2str(20*log10(Gm0)), 'dB, ', '####=' ,num2str(Pm0), '#']);
% #####Wc= 73.8102
% #####=14.2881dB,#####=45.4878#

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#####
[numb,denb]=cloop(numg2,deng2); #####
G2=tf(numb,denb) ;#####

% -----
#####
t=0:0.001:1; n=length(t)
G2=tf(numb,denb) ;#####
[y1]=step(numb,denb,t);#####

figure
y=step(numb,denb,t);#####
plot(t,y,t,1+0*t)
title('#####')
yss=y(n) #####
Mp=((max(y)-yss)/yss);
disp(['#####M1=',num2str(Mp)]); #####Mp

for i=n:-1:1#####
    if y(i)>=1.02*yss|y(i)<=0.98*yss #####2#####
        ts=t(i);%ts#####
        break
    end
end
disp('####ts0:'),disp(ts)

#####
GG=G2;
GGG=tf(GG.den{1}-GG.num{1},GG.den{1}); %1-fai(s)
nums=[1 0];dens=1;Gs=tf(nums,dens);
GGGG=GGG*Gs; #####
numr=1;denr=[1,0];R=tf(numr,denr); #####
ess=dcgain(GGGG*R) #####
% -----

%-----
% #####
t=0:0.0001:10; n=length(t);
alpha = 1;
ramp = alpha*t;
[y2]=lsim(G2,ramp,t);#####
yr=1*t;
lsimplot(G2,ramp,t) #####
essmax=[];
for i = 1:2000
    essmax(i) =abs(yr(i)-y2(i));
end
[m,p]=max(essmax) #####t=0.0238,essmax#0.0143

#####
GG=G2;

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GGG=tf(GG.den{1}-GG.num{1},GG.den{1}); %1-fai(s)
nums=[1 0];dens=1;Gs=tf(nums,dens);
GGGG=GGG*Gs; #####
numr=1;denr=[1,0,0];R=tf(numr,denr); #####5.0026e-05
ess=dcgain(GGGG*R) #####

%-----#####
t=0:0.0001:0.1; n=length(t);
aa=(t.*t)/2;
[ya]=lsim(G2,aa,t);#####

figure
plot(t,ya,'r',t,t.*t/2,'b')
title('#0#1#####')

essmax=[];
for i = 1:100
    essmax(i) =abs(aa(i)-ya(i));
end
[m,p]=max(essmax) #####

#####
GG=G2;
GGG=tf(GG.den{1}-GG.num{1},GG.den{1}); %1-fai(s)
nums=[1 0];dens=1;Gs=tf(nums,dens);
GGGG=GGG*Gs; #####
numr=1;denr=[1,0,0,0];R=tf(numr,denr); #####
ess=dcgain(GGGG*R) #####
% -----

% % -----####
w=0.628; usin=400*sin(w*t)/w;
[y3]=lsim(G2,usin,t);#####
yr=usin;
figure
subplot(1,2,1)
plot(t,y3,'r',t,yr,'b') #####
title('#####')
grid on

%#t#####m
m=0:0.0001:0.10; n=length(m);
w=0.628; usin=400*sin(w*m)/w; yr2=usin;
[y4]=lsim(G2,usin,m);
subplot(1,2,2)
plot(m,y4,'r',m,yr2,'b') #####
grid on
title('#####0#0.1#')

essmax=[];
for i = 1:1000
    essmax(i) =abs(yr(i)-y3(i));

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```

end
[m,p]=max(essmax) %#####

%-----
%#####
GG=G2;
GGG=tf(GG.den{1}-GG.num{1},GG.den{1}); %1-fai(s)
nums=[1 0];dens=1;Gs=tf(nums,dens);
GGGG=GGG*Gs; %####
numr=400;denr=[1,0,w^2];R=tf(numr,denr); %####ess=0
ess=dcgain(GGGG*R) %####

```

*Warning: The closed-loop system is unstable.*

*Gm0 =*

*0.0176*

*Pm0 =*

*-58.4549*

*Wcg0 =*

*108.9340*

*Wcp0 =*

*593.7126*

*####Wc#*

*#####=-35.0848dB,####=-58.4549#*

*Gm0 =*

*3.2024*

*Pm0 =*

*17.8956*

*Wcg0 =*

*92.1956*

*Wcp0 =*

*48.6399*

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####Wc0  
#####10.1095dB,####17.8956#

Gm0 =  
5.1767

Pm0 =  
45.4707

Wcg0 =  
212.8007

Wcp0 =  
73.8601

####WcI  
#####14.2811dB,####45.4707#

n =  
1001

yss =  
1.0000

#####M1=0.28448  
####ts0:  
0.1940

ess =  
0

m =  
0.0143

p =  
239

---

*ess* =

5.0000e-05

*m* =

4.7356e-05

*p* =

100

*ess* =

*Inf*

*m* =

5.7096

*p* =

239

*ess* =

0

```
#####BODE #  
numc1=[0.1042,1]; denc1=[26.455,1]; %9.6-up,0.0378-down  
numc2=[0.028447,1]; denc2=[0.006472,1]; %35.15-up,154.52=down  
[numc,denc]=series(numc1,denc1,numc2,denc2);  
#####Bode #  
figure;  
bode(numc,denc)  
grid on  
title('##-#####Bode #')
```

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