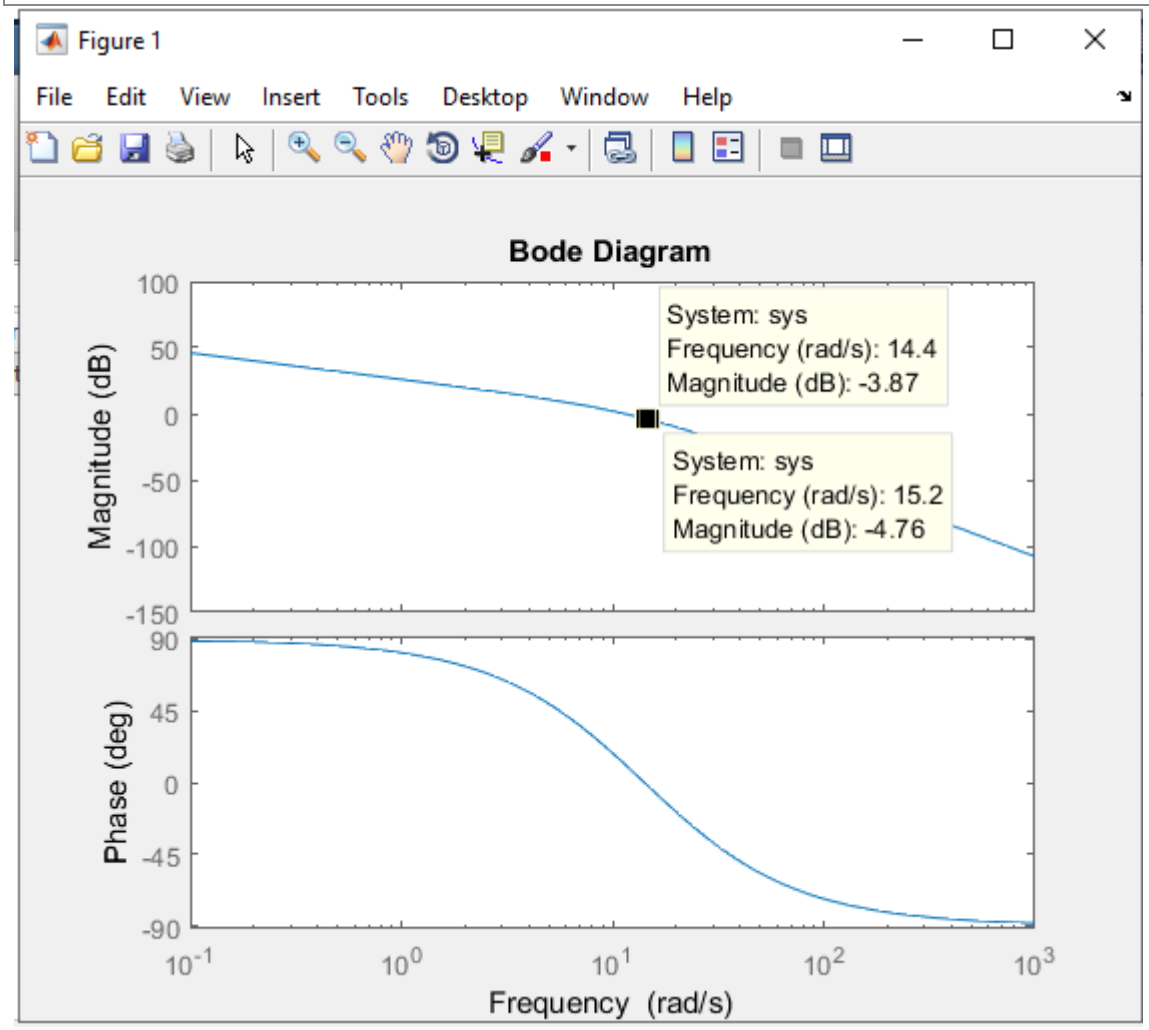
UNCOMPENSATED SYSTEM

```
num = [-4000];
den = [1 30 200 0];
G = tf(num, den);
bode(G);
```

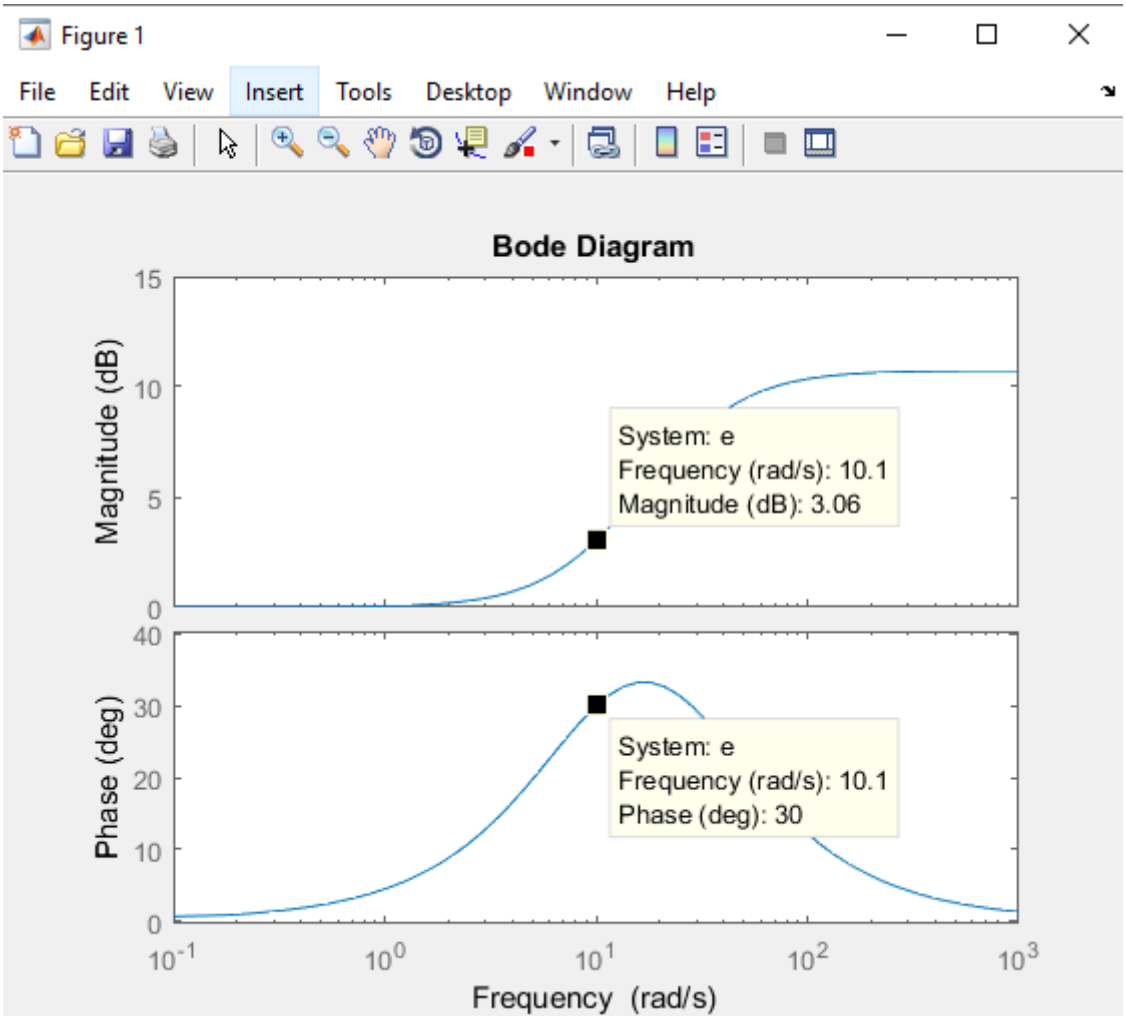


Wm=15.2rad/sec for 30 lead compensator

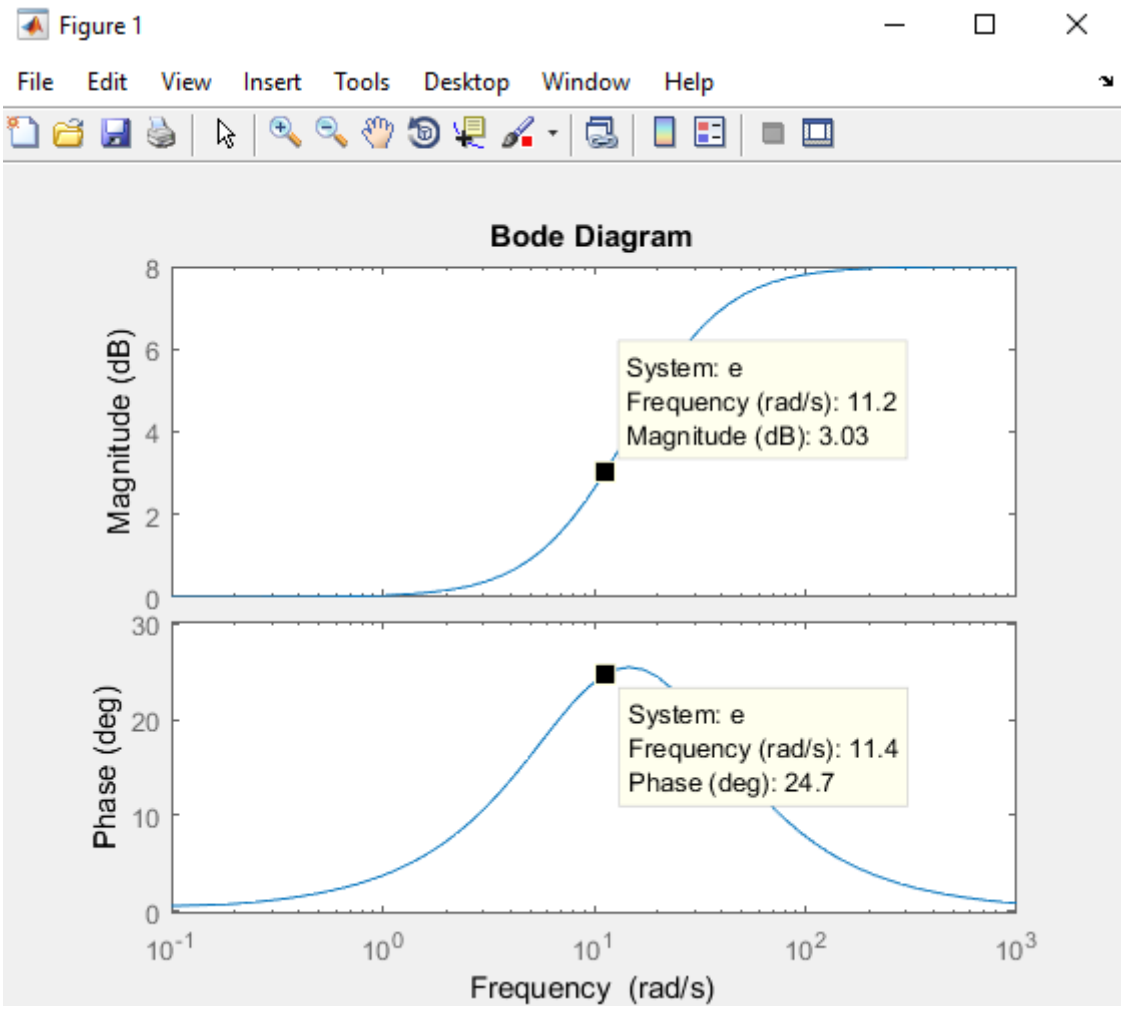
Wm=14.4 rad/sec for two stage 55 lead compensator

LEAD COMPENSATOR WITH 30* PHASE MARGIN

```
num=[0.11 1];
denum=[0.032 1];
e=tf(num,denum);
bode(e);
```



LEAD COMPENSATOR WITH 25* PHASE MARGIN For 2 Stage 55* compensator



BANDWIDTH OF SYSTEM WITH 30LEAD COMPENSATOR

```
num= [4000 440]
den=[1 30.32 209.6 64 0]
sys=tf(num,den)

sys1=feedback(sys,1)
bandwidth(sys1)
```

ans = 17.6245

BANDWIDTH OF SYSTEM WITH 55LEAD TWO STAGE COMPENSATOR

```
num= [432 4048 440]
den=[0.043  2.304 39.33 212.4 64 ]
sys=tf(num,den)

sys1=feedback(sys,1)
bandwidth(sys1)
```

ans =

23.4872

So bandwith of 30 degree compensator system is less than 55 degree compensator system so signal to noise ratio is improved

f) Plot the unit-step response for the systems of parts (c) and (d) and compare percent

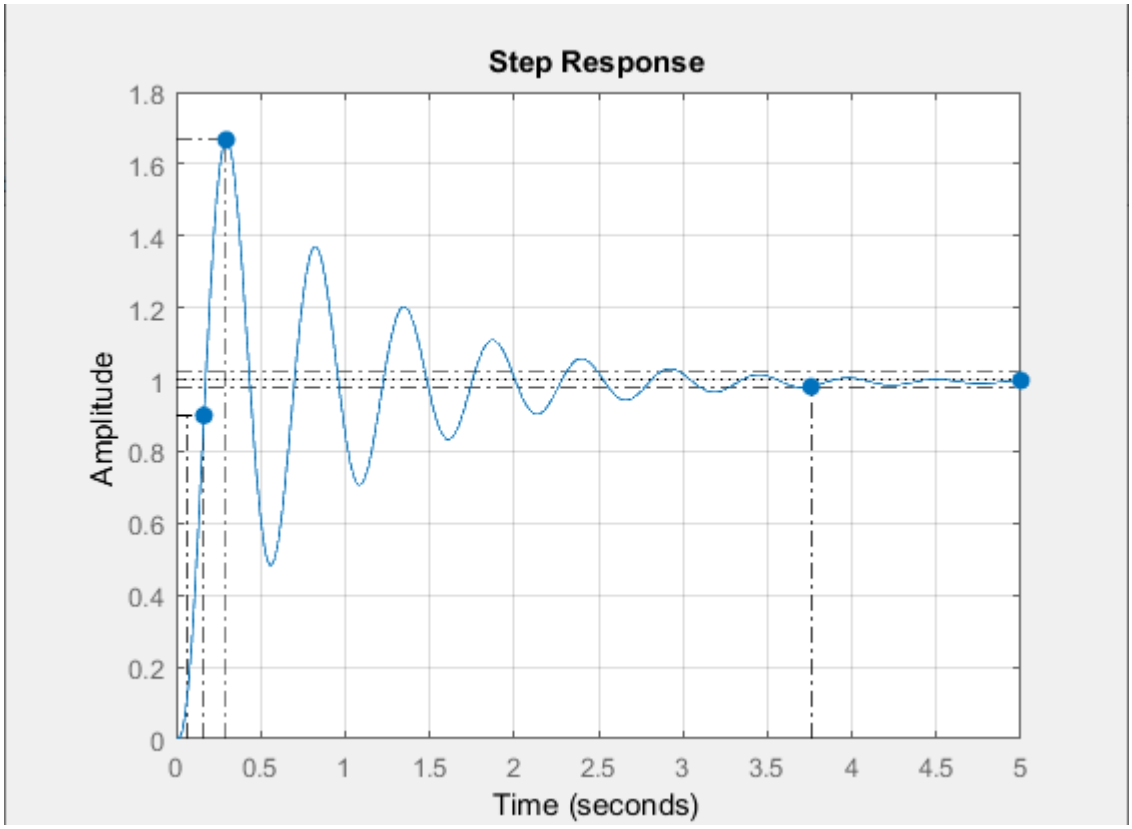
overshoot, rise time, peak time, steady-state error and set-tling time (with a 2%

criterion)

ONE STAGE SYSTEM

```
num= [4000 440]
den=[1 30.32 209.6 64 0]
sys=tf(num,den);

sys1=feedback(sys,1);
step(sys1)
stepinfo(sys1)
```



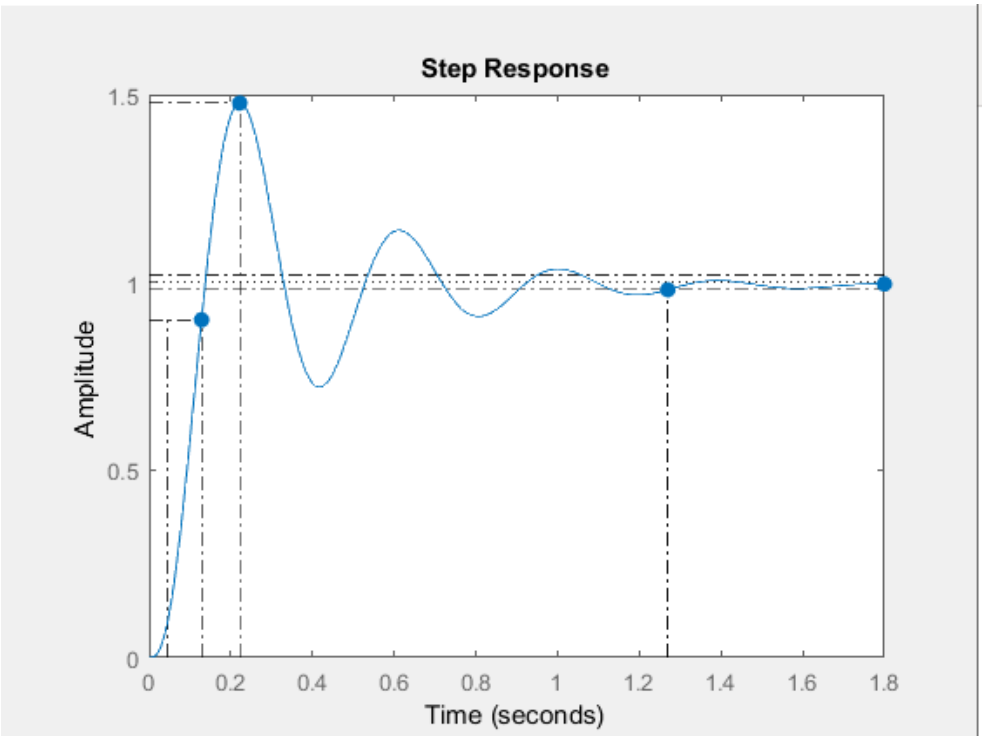

```
ans =

      RiseTime: 0.1030
  SettlingTime: 3.7587
   SettlingMin: 0.4838
   SettlingMax: 1.6672
     Overshoot: 66.7166
    Undershoot: 0
          Peak: 1.6672
      PeakTime: 0.2961
```

STEP RESPONSE OF TWO STAGE SYSTEM

```
num= [432 4048 440]
den=[0.043  2.304 39.33 212.4 64 ]
sys=tf(num,den);

sys1=feedback(sys,1);
bandwidth(sys1);
step(sys1)
stepinfo(sys1)
```



RiseTime: 0.0823
SettlingTime: 1.2697
SettlingMin: 0.7205
SettlingMax: 1.4776
Overshoot: 47.7576
Undershoot: 0
Peak: 1.4776
PeakTime: 0.2219