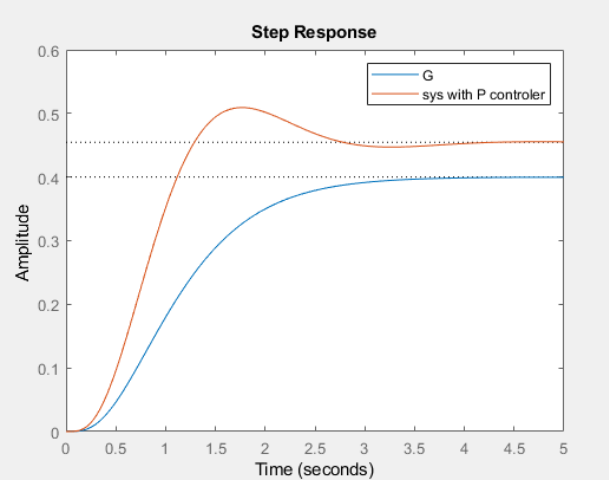
ریحانه هادی پور

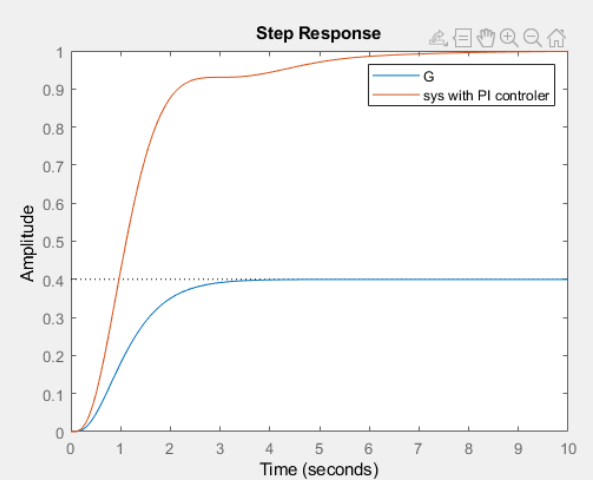
9731123

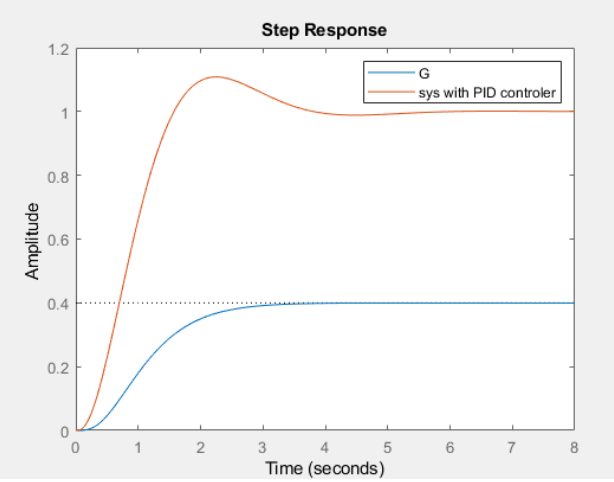
پروژه نهایی کنترل صنعتی

طراحی PID:

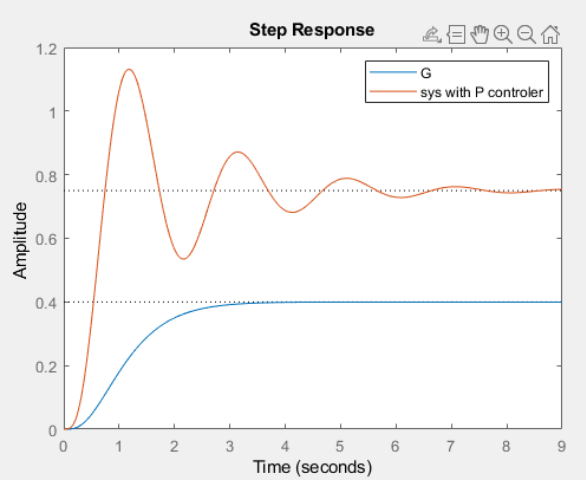
```
%Zigler-Nicholes (I)
%a=0.48 L=0.35
%%%%%%%%P
%aK=1 => k=1/a=1/0.48=2.0833 Tp=4*L=4*0.35=1.4
%C=2.0833;
%%%%%%%%PI
%k=0.9/a=0.9/0.48=1.875      Ti=3L=3*0.35=1.05        Tp=5.7*L=5.7*0.35=1.995
%%%%%%%%PID
%k=1.2/a=1.2/0.48=2.5        Ti=2L=2*0.35=0.7         Td=L/2=0.35/2=0.175      Tp=3.4L=1.19
```

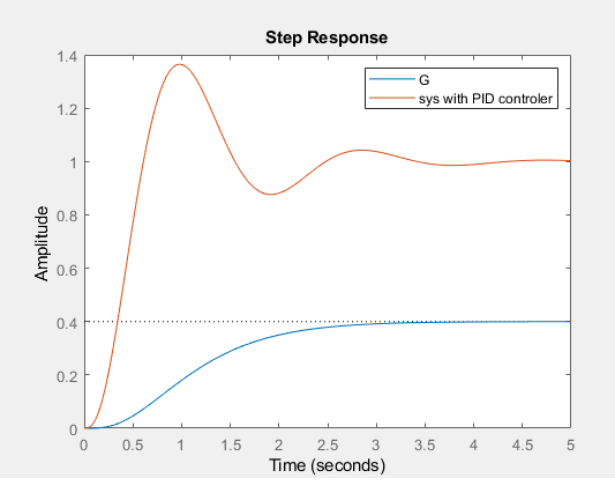


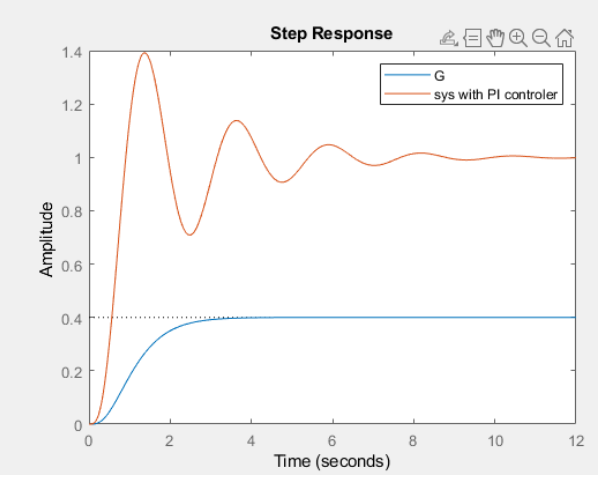




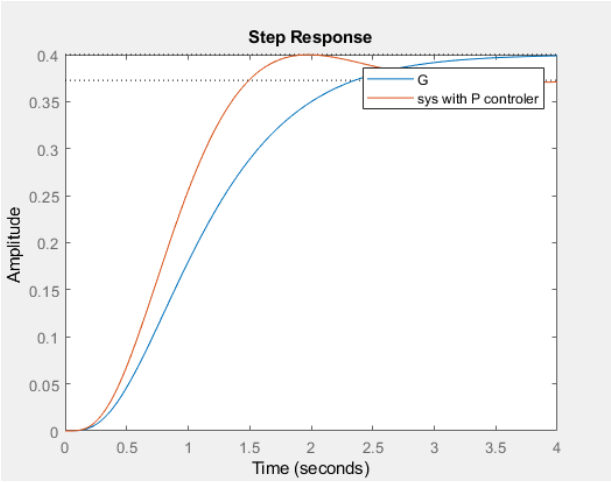
```
%%
%Zigler-Nicholes (II)
%Ku*G(jw)=-1
%Ku*G=Ku*(lll.45*(jw+5.2)/((jw+2)*(jw+2.8)*(jw+3)*(jw+8.8)*(jw+9.8)));
%Ku=15 w=4 Tu=pi/2
%%%%%%%%P
%K/Ku=0.5 => K=15*0.5=7.5
%%%%%%%%PI
%K/Ku=0.4 => K=15*0.4=6       Ti/Tu=0.8 =>Ti=0.4*pi     Tp/Tu=1.4=>Tp=0.7*pi
%%%%%%%%PID
%K/Ku=0.6 => K=9          Ti/Tu=0.5=>Ti=0.25*pi         Td/Tu=0.125 =>
%Td=0.0625*pi        Tp/Tu=0.85 =>Tp=0.425*pi
```

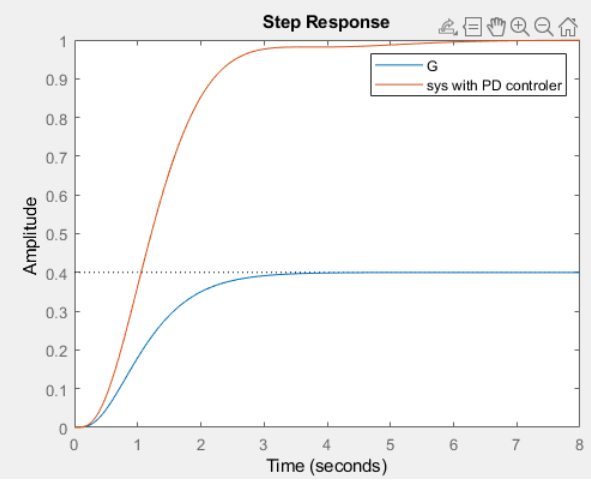


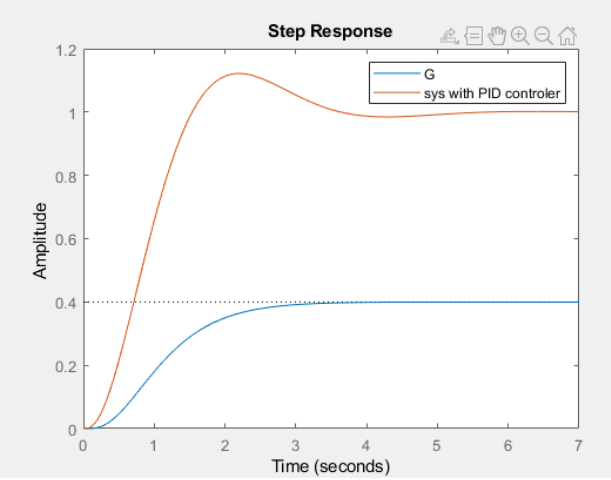




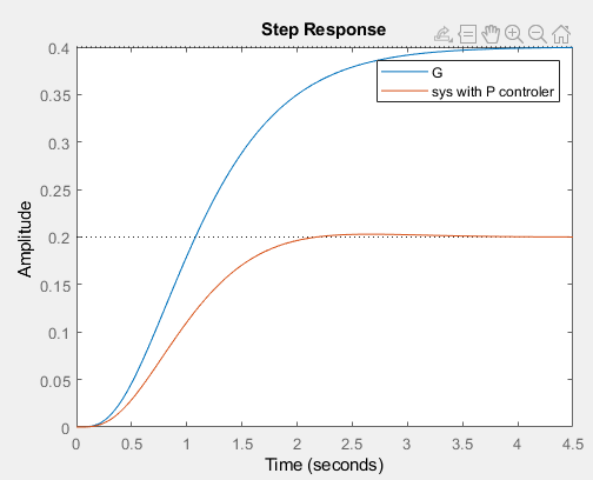
```
%Chein,Hrones and Reswick
%__disturbance response
%_____No overshoot
%%%%%%%%P
%aK=0.3 => k=0.3/a=0.3/0.48=0.6253
%%%%%%%%PI
%k=0.6/a=0.6/0.48=1.25      Ti=4L=4*0.35=1.4
%%%%%%%%PID
%k=0.95/a=0.95/0.48=2.375        Ti=2.4L=2.4*0.35=0.84       Td=0.42*L=0.42*0.35=0.147
%_____20% overshoot
%%%%%%%%P
%aK=0.7 => k=0.7/a=0.7/0.48=1.458
%%%%%%%%PI
%k=0.7/a=0.7/0.48=1.458      Ti=2.3L=2.3*0.35=0.805
%%%%%%%%PID
%k=1.2/a=1.2/0.48=2.5       Ti=2L=2*0.35=0.7       Td=0.42*L=0.42*0.35=0.147
```

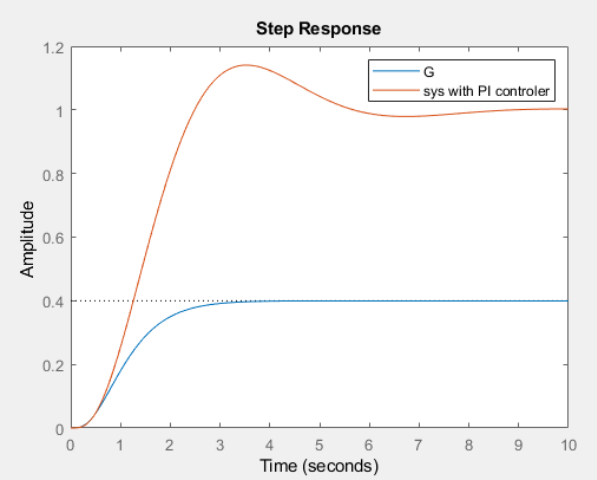


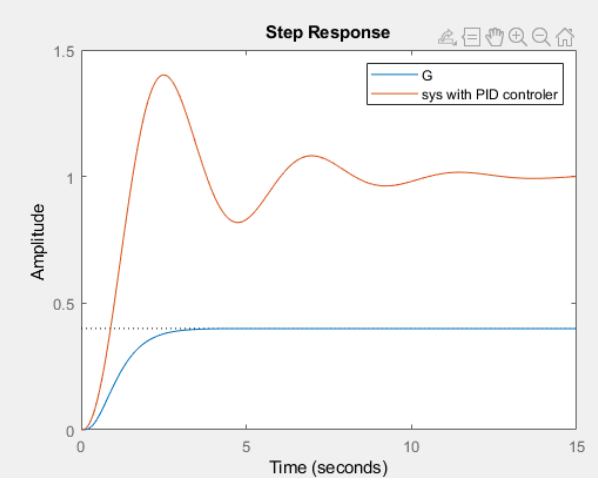




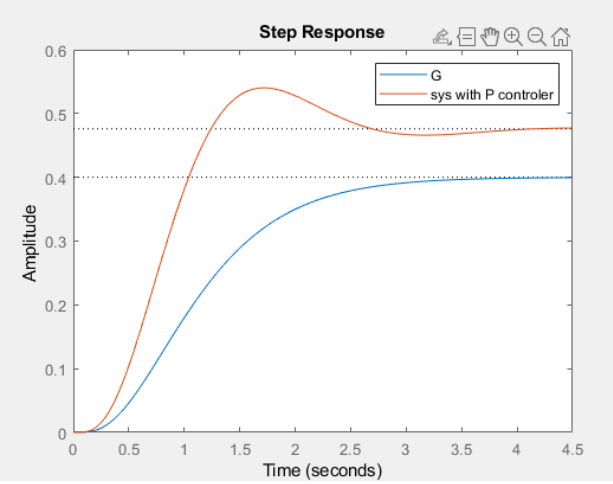
```
%__step response
%_____No overshoot
%Tg=LKp/a=0.35*0.4/0.48=0.2917
%%%%%%%%P
%aK=0.3 => k=0.3/a=0.3/0.48=0.6253
%%%%%%%%PI
%k=0.35/a=0.35/0.48=0.7292     Ti=1.2Tg=1.2*0.2917=0.35
%%%%%%%%PID
%k=0.6/a=0.6/0.48=1.25     Ti=1*Tg=0.2917    Td=0.5*Tg=0.5*0.2917=0.1459
%_____20% overshoot
%%%%%%%%P
%aK=0.7 => k=0.7/a=0.7/0.48=1.458
%%%%%%%%PI
%k=0.6/a=0.6/0.48=1.25     Ti=1*Tg=0.2917
%%%%%%%%PID
%k=0.95/a=0.95/0.48=1.9792     Ti=1.4*Tg=0.4084   Td=0.47*Tg=0.47*0.2917=0.1371
```

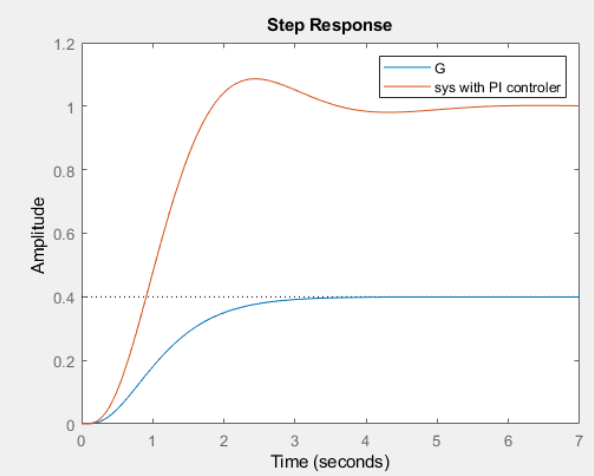


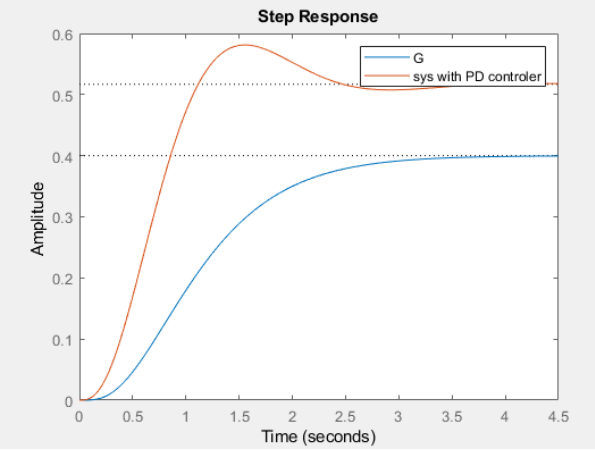


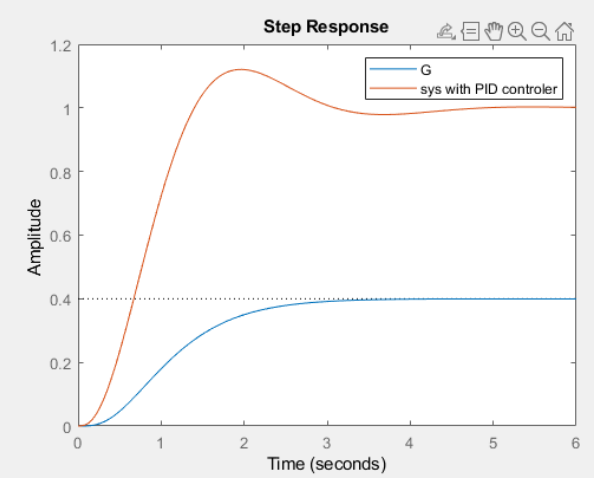


```
%Cohen-Coon
%T=T_0.63=1.3 s    a=KpL/T=0.4*0.35/1.3=0.1077
%t=L/(L+T)=0.35/(0.35+1.3)=0.2121
%%%%%%%%P
%K=2.27
%%%%%%%%PI
%k=1.92144     Ti=0.743149
%%%%%%%%PD
%k=2.67374     Td=0.0831118
%%%%%%%%PID
%k=2.94878     Ti=0.792047    Td=0.123199
```

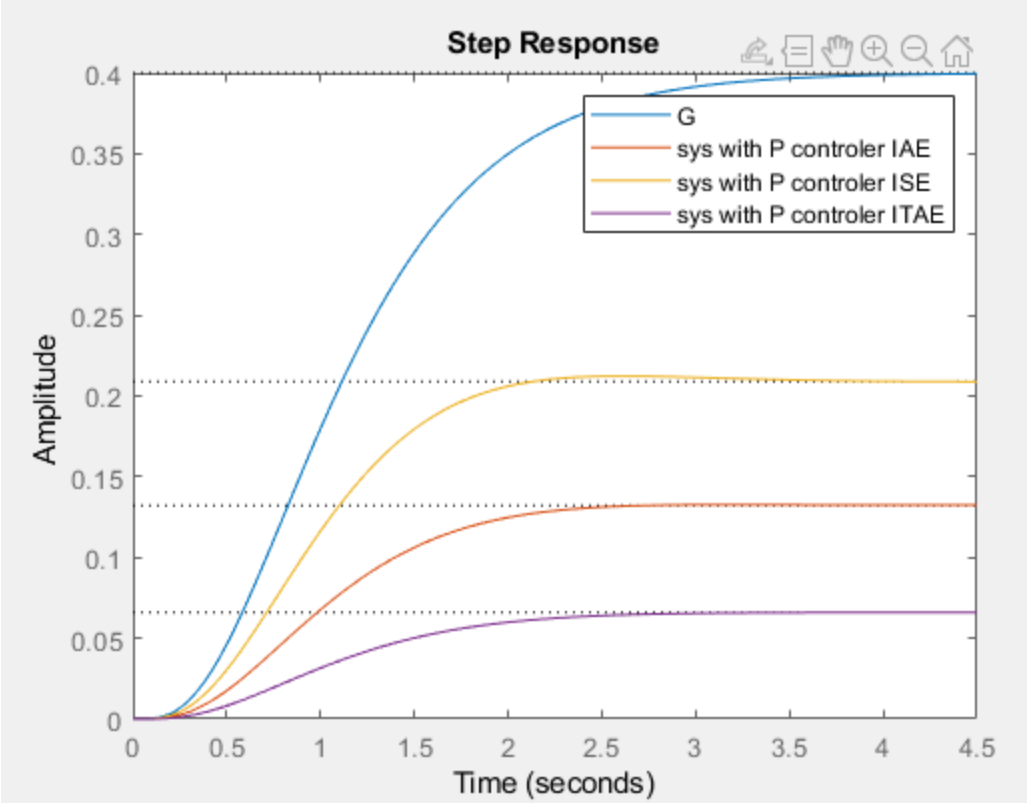




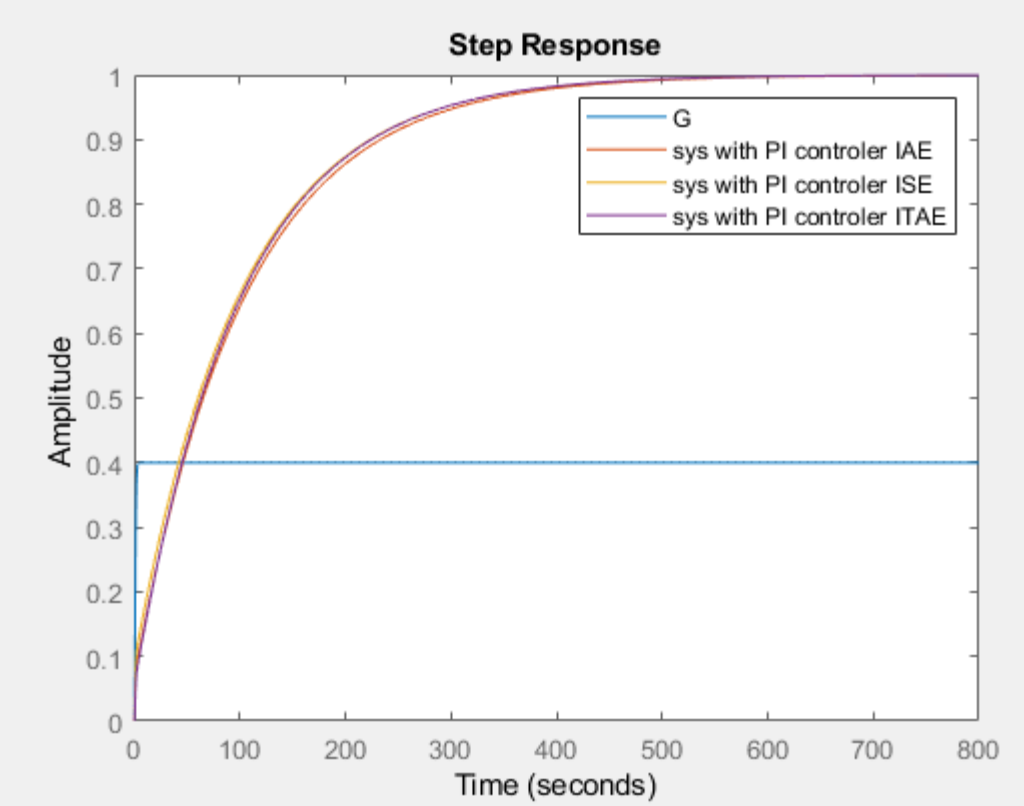




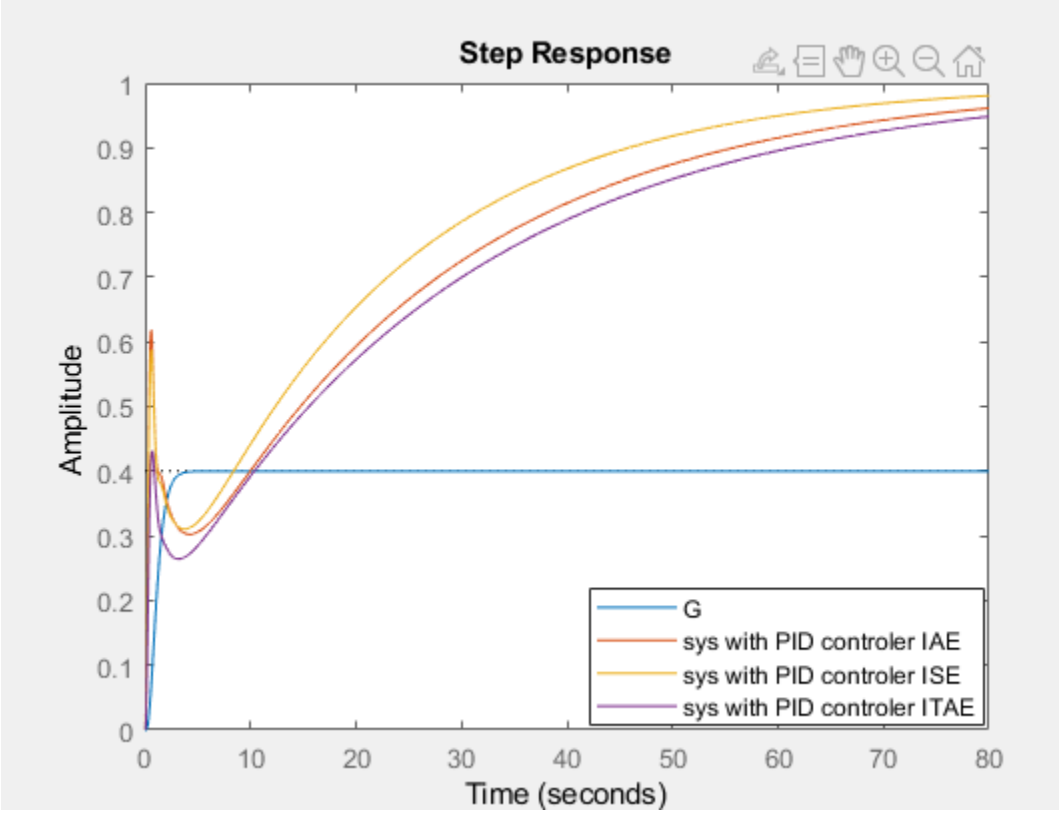
```
%%%%%%%%P
%%%IAE
%a=0.9  b=0.98
%%%ISE
%a=1.4  b=0.92
%%%ITAE
%a=0.5  b=1.08
%k=(1/0.4)*a*(theta^(-b))
```



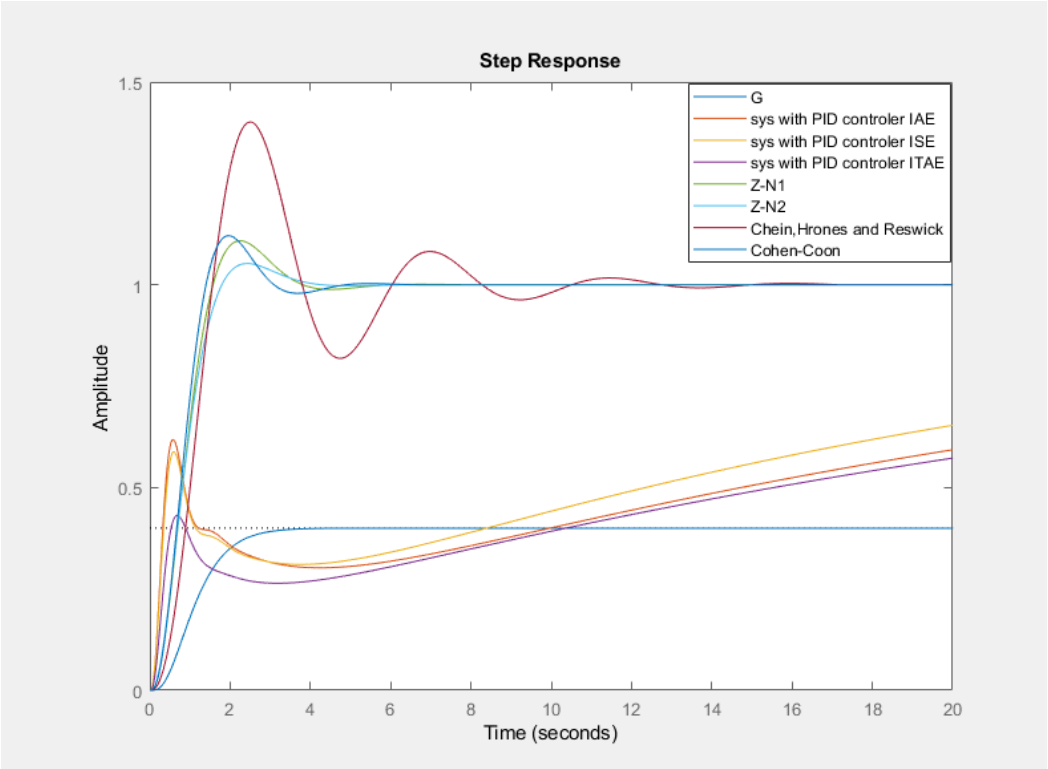
```
%%%%%%%%PI
%%%IAE
%a=0.98  b=0.98 c=1.65  d=0.71
%%%ISE
%a=1.3  b=0.96 c=2.03  d=0.74
%%%ITAE
%a=0.86  b=0.98 c=1.48  d=0.68
%k=(a/K)*a*(theta^(-b))
%Ti=Tc*(theta^(d))
```

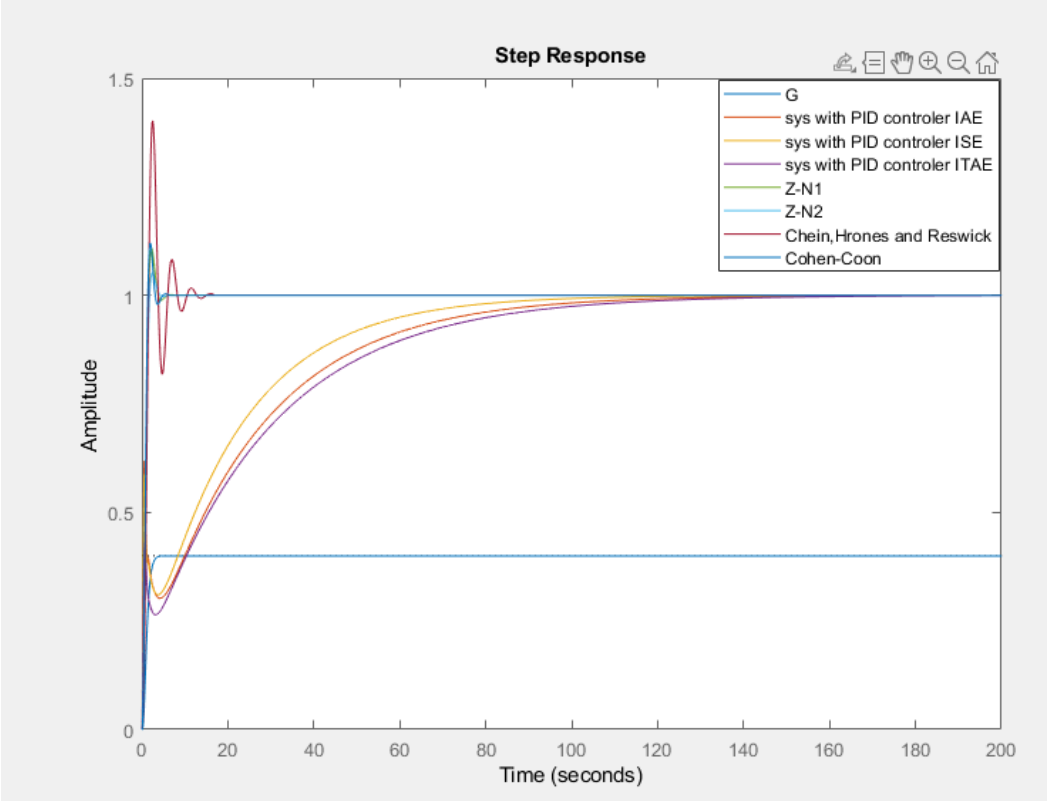


```
%%%%%%%%PID
%%%IAE
%a=1.4  b=0.92 c=1.14  d=0.75   e=0.48   f=1.14
%%%ISE
%a=1.5  b=0.95 c=0.92  d=0.77   e=0.56   f=1
%%%ITAE
%a=1.36  b=0.95 c=1.18  d=0.74   e=0.38   f=1
%k=(1/K)*a*(theta^(-b))
%Ti=Tc*(theta^(d))
%Td=Te*(theta^(f))
```



جمع بندی:


Step Response
G
sys with PID controler IAE
sys with PID controler ISE
sys with PID controler ITAE
Z-N1
Z-N2
Chein,Hrones and Reswick
Cohen-Coon
Amplitude
Time (seconds)
0
0.5
1
1.5
0
2
4
6
8
10
12
14
16
18
20


Step Response
G
sys with PID controler IAE
sys with PID controler ISE
sys with PID controler ITAE
Z-N1
Z-N2
Chein,Hrones and Reswick
Cohen-Coon
Amplitude
Time (seconds)
0
0.5
1
1.5
0
20
40
60
80
100
120
140
160
180
200

همانطور که از پاسخ پله های رسم شده متوجه میشویم، روش زیگلر نیکولز بین همگی انها از سرعت بالایی برخوردار است و روش های IAE & ISE &ITAE از کمترین سرعت برخوردارند. همچنین بیشترین OverShoot مربوط به روش CHR است. در مجموع به نظر میرسد روش زیگلر نیکولز و روش Cohen-Coon بهترین نتایج را نشان داده اند.