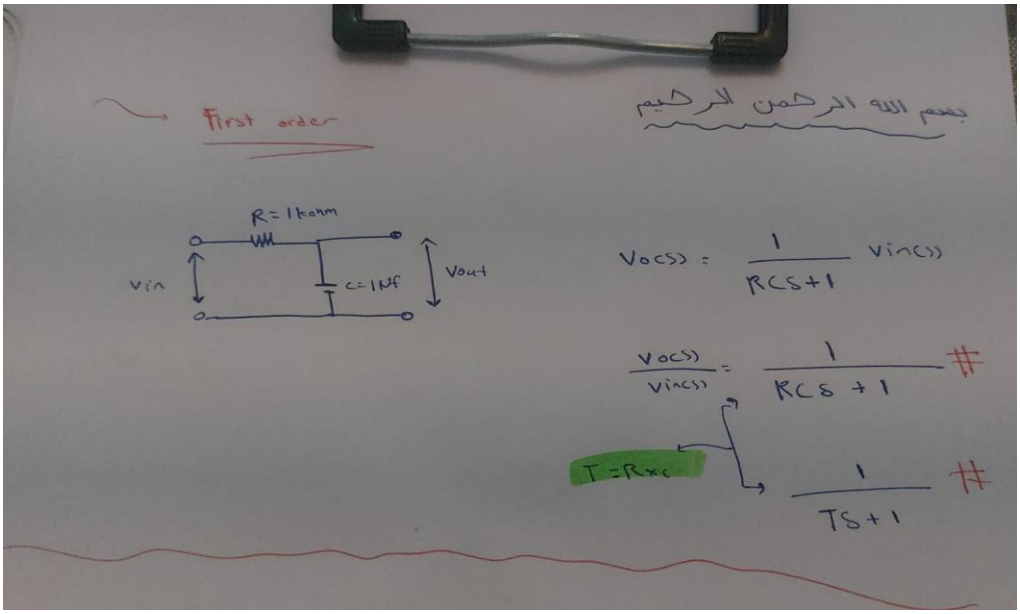
Mazen HossamEldeen Hassan Mbd_Diploma

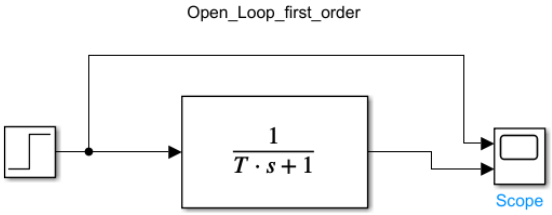
LAB_Project_comprehensive

First_order

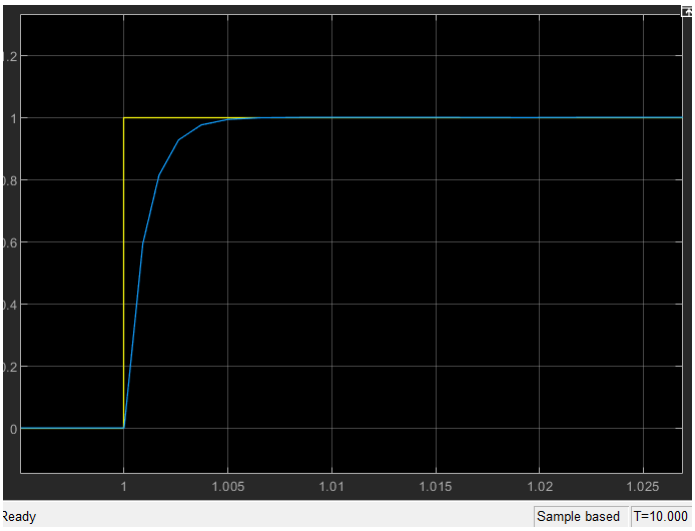


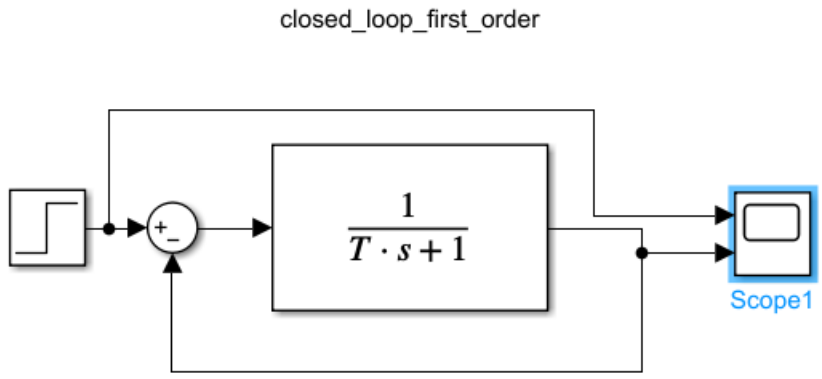
First_order_script.m

```
%First order system
k=1;
R=1e3;
C= 1e-6;
T=R*C;
```

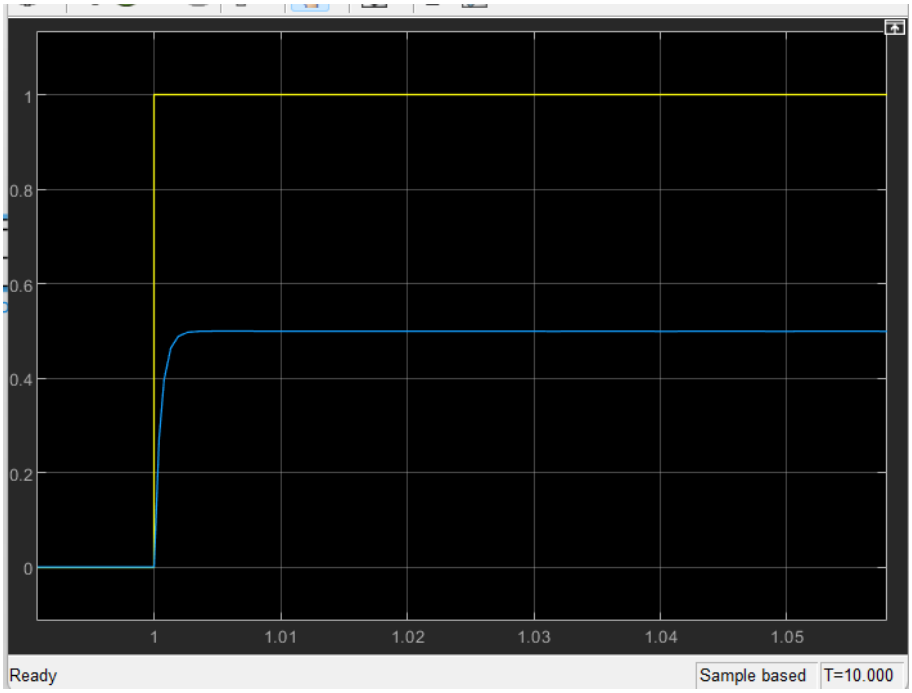


Open-loop-response





Closed-loop-response



->As you can see here in the closed loop response there is steady state error of 0.5 so will be using pid for the best optimum results

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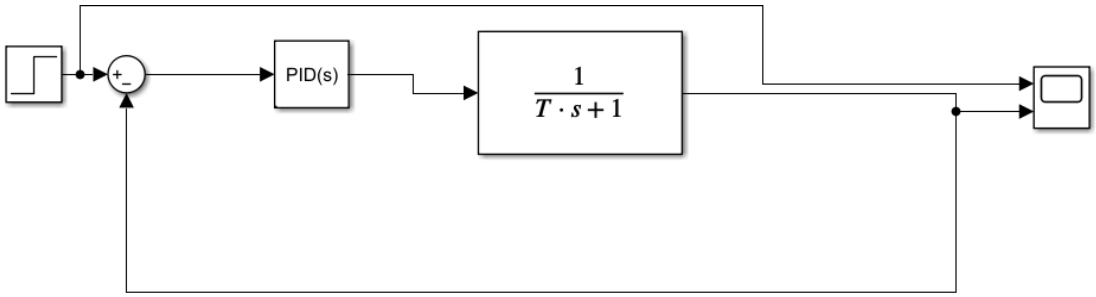
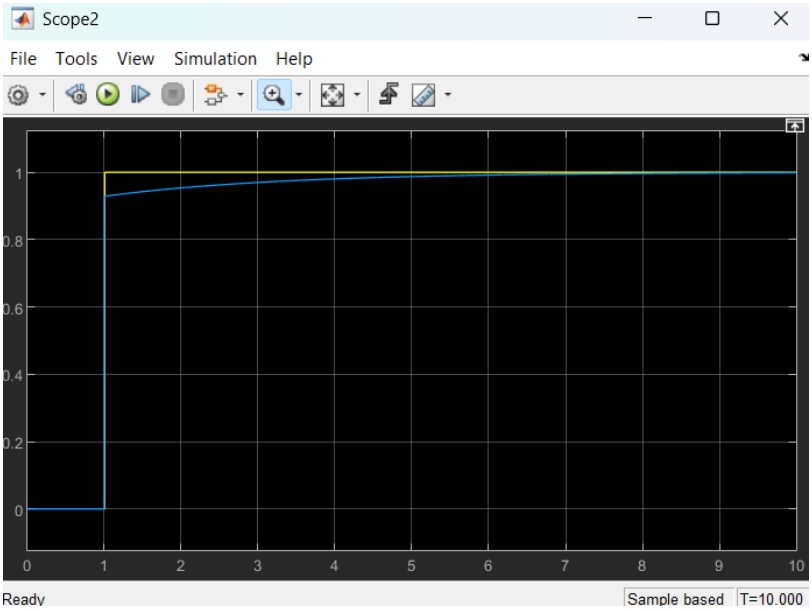
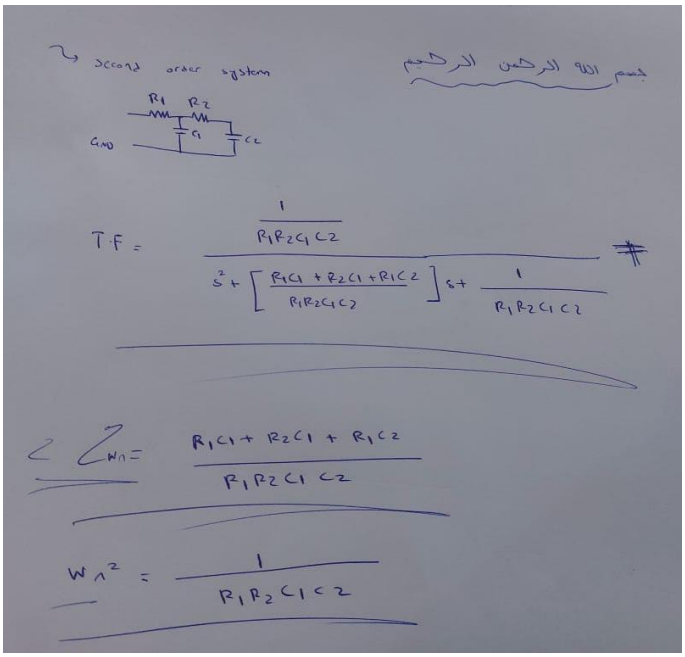
Closed loop with pid controller





After try and error check I was able to reach a kp=13 and ki = 6 and kd = 0.004 which led to steady state error to zero and smoth curve

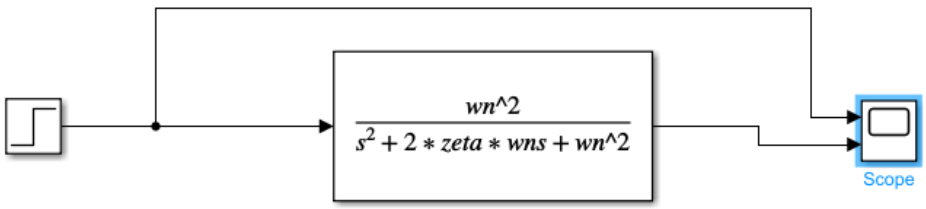
Second-order-systems

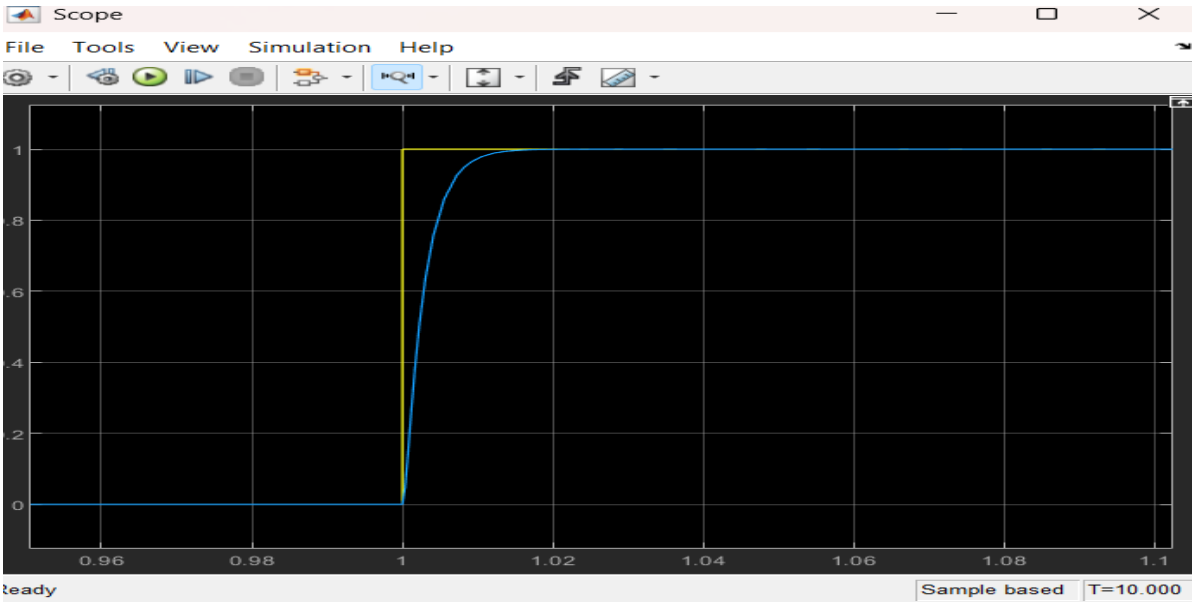


Case1

Open_loop_response

```
%second_order_system
%CASE1
R1=2000;
R2=2000;
C1=0.5e-6;
C2=0.5e-6;
wn=1/(R1*C1);
zeta =((R1*C1)+(R1*C2)+(R2*C2))/(2*wn*(R1*R2*C1*C2));
```




Scope
File Tools View Simulation Help
1
.8
.6
.4
.2
0
0.96 0.98 1 1.02 1.04 1.06 1.08 1.1
eady
Sample based
T=10.000

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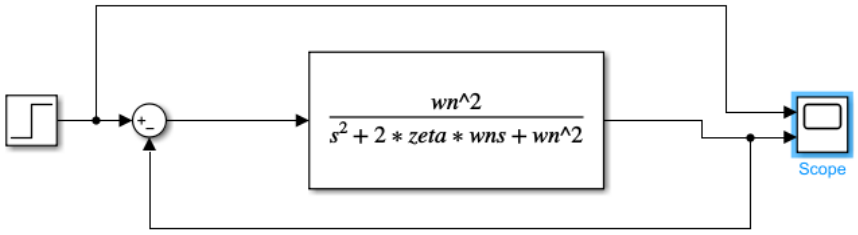
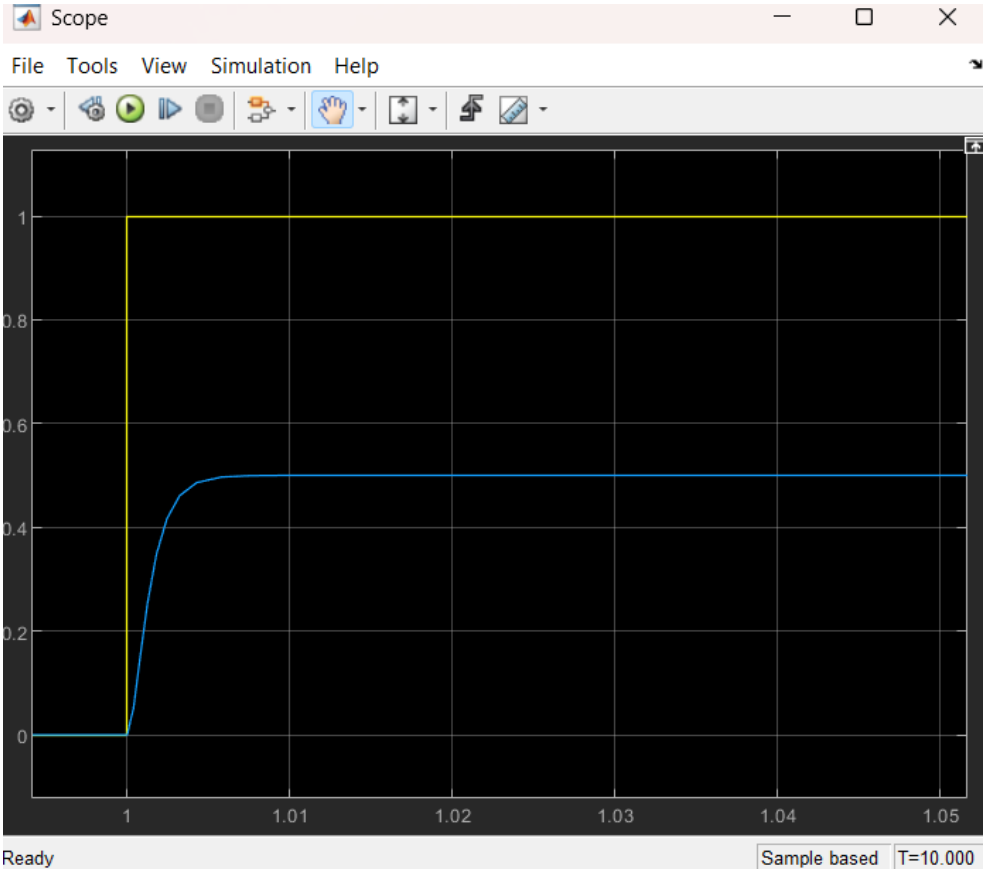
Closed_loop_response





->As you see here in the closed loop response the settling time is 1.01 and there is steady state error of 0.5

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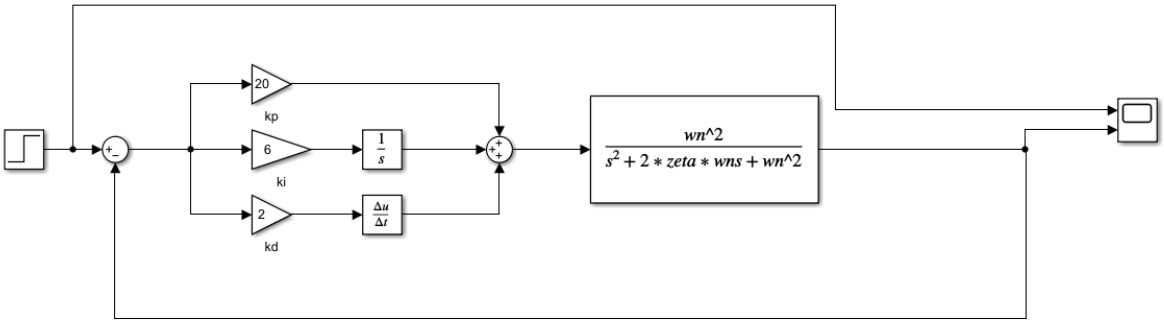
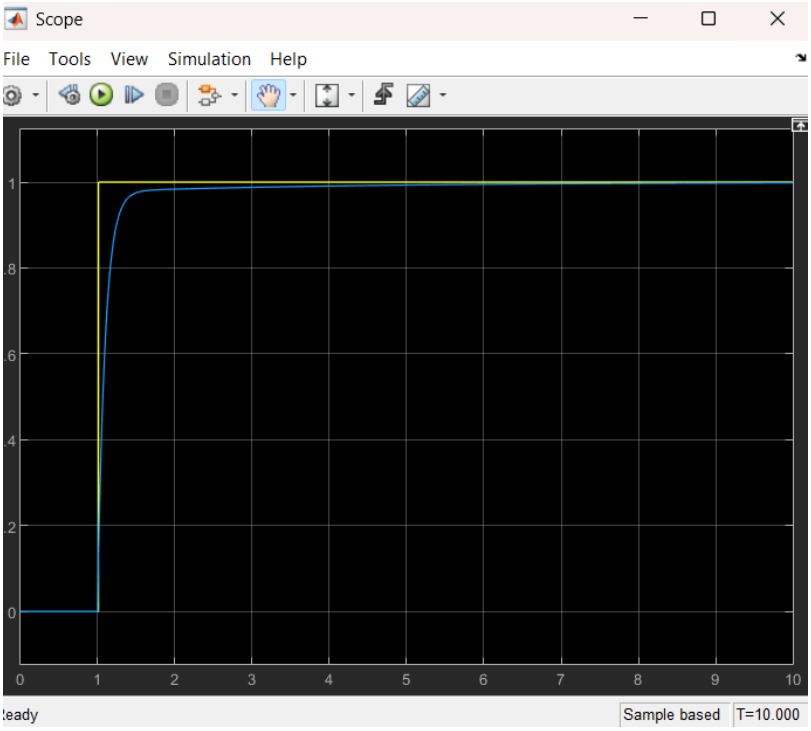
Closed_loop_response_with_pid_controller

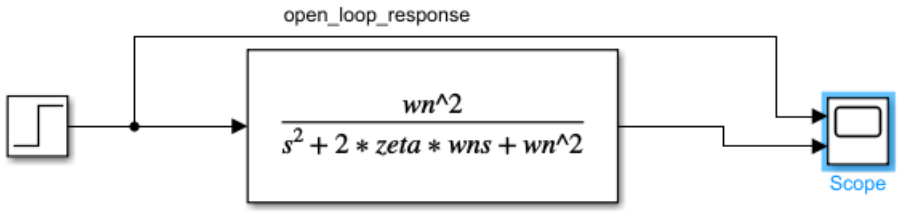


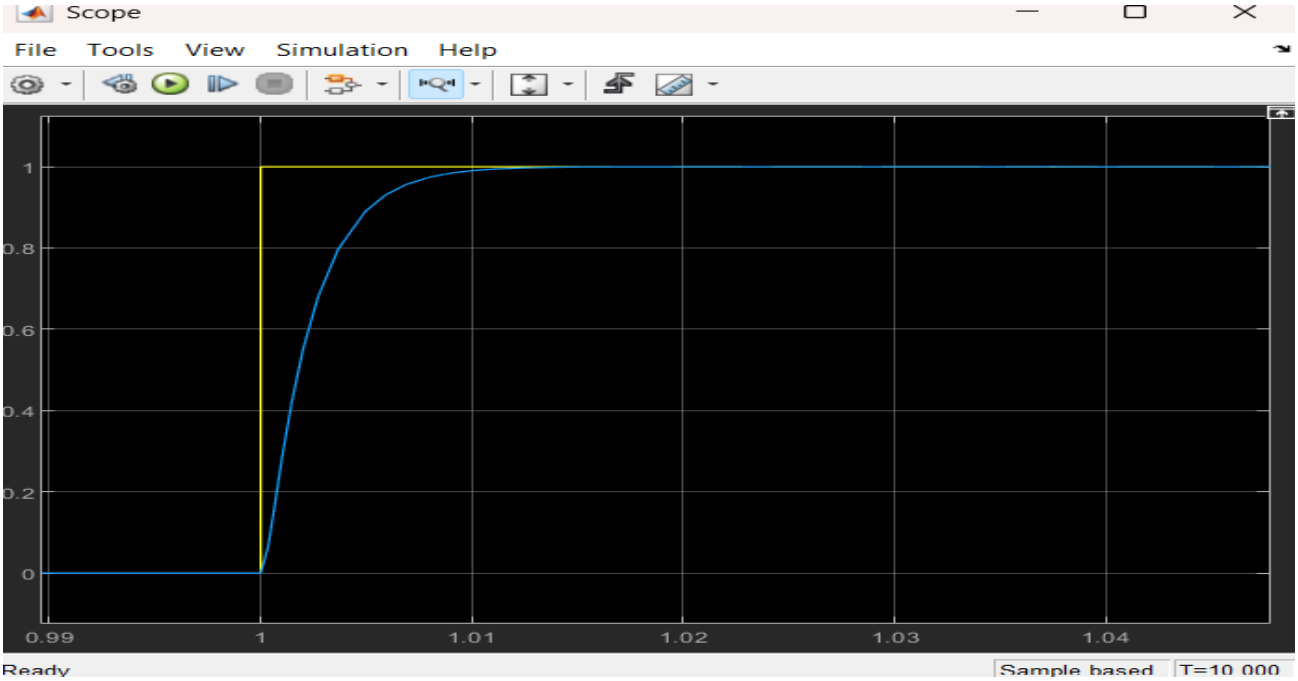


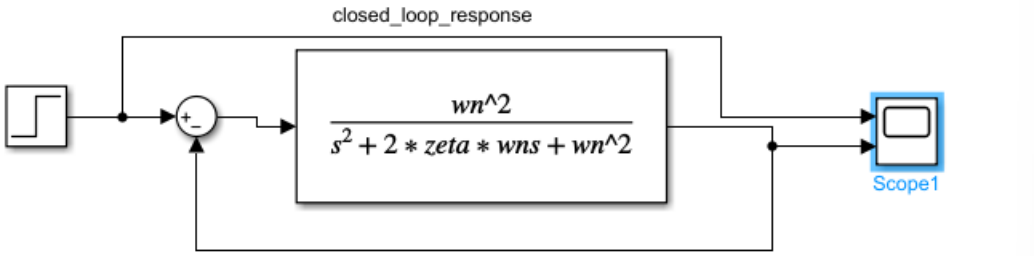
After try and error I was able to reach to this system response with no overshoot and steady state error equal to zero

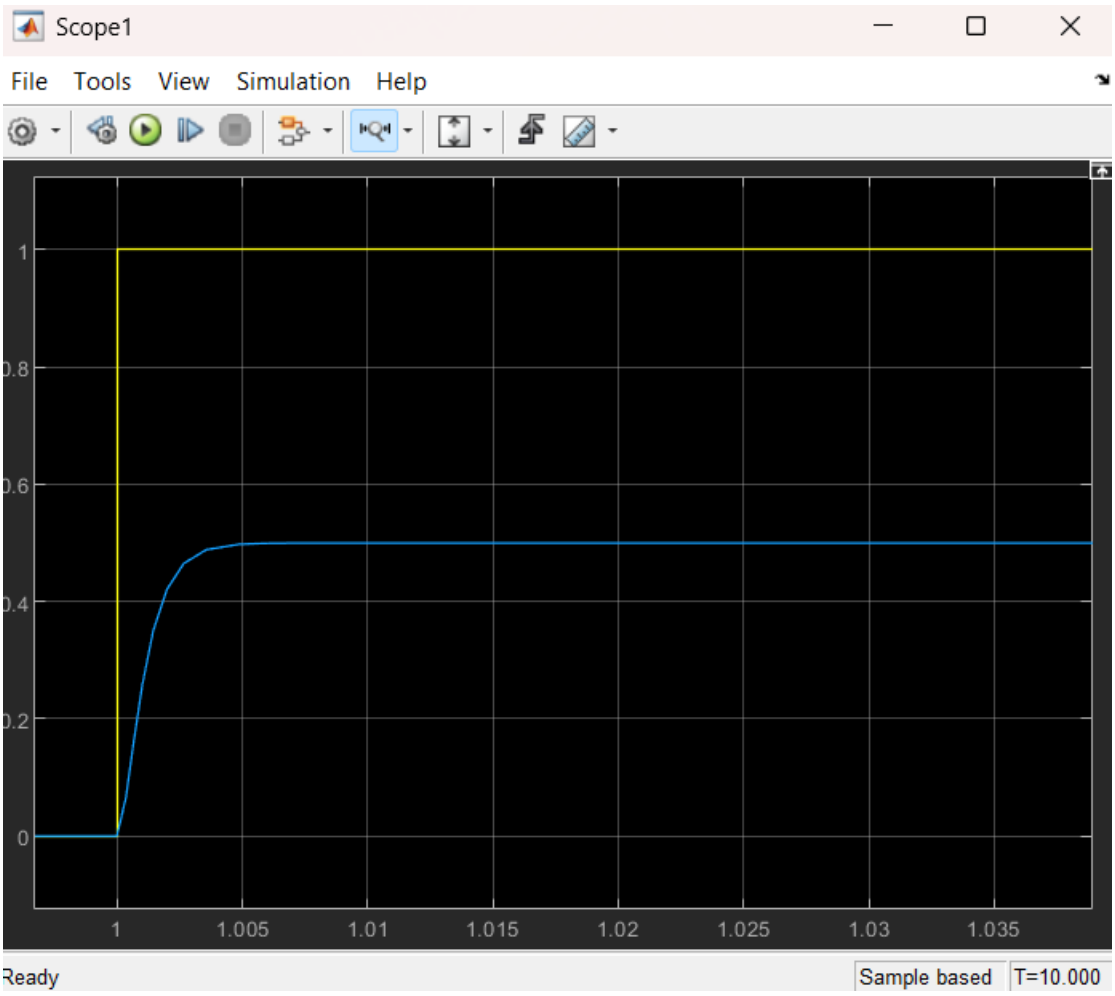
Case 2

```
%second_order_system
%CASE2
R1=4000;
R2=4000;
C1=0.2e-6;
C2=0.2e-6;
wn=1/(R1*C1);
zeta =((R1*C1)+(R1*C2)+(R2*C2))/(2*wn*(R1*R2*C1*C2));
```









->There is an steady state error of 0.5

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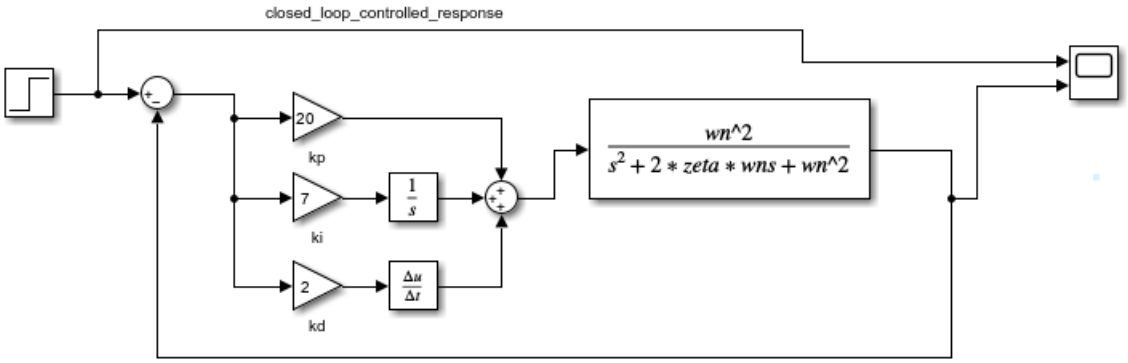
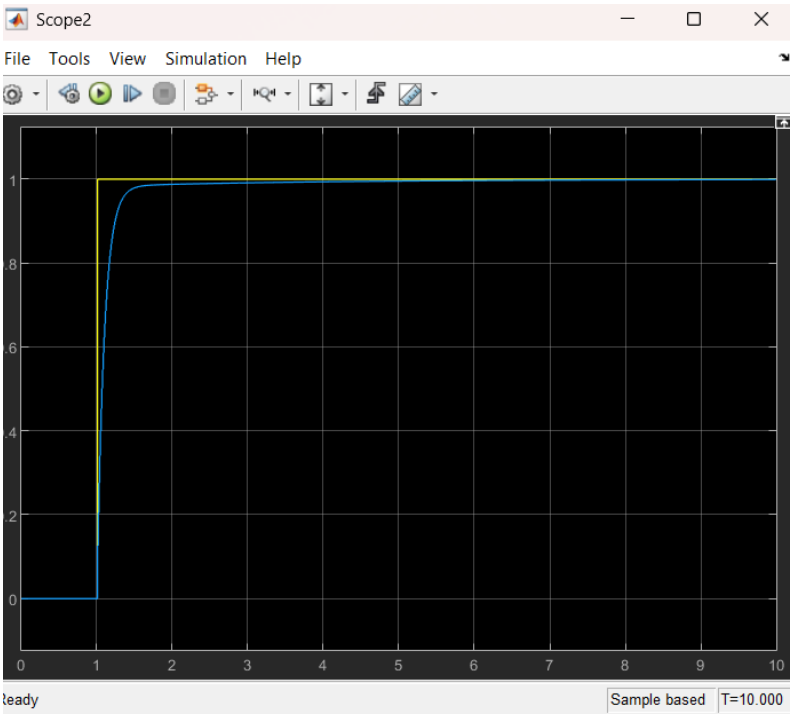
Closed_loop_controlled

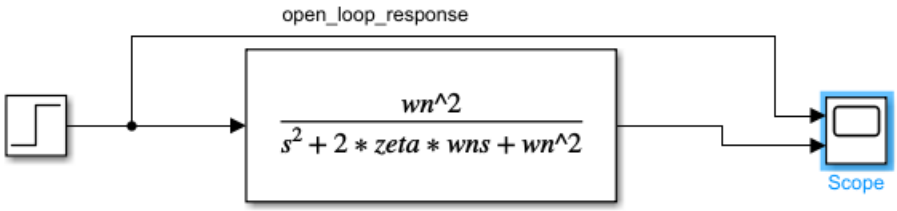


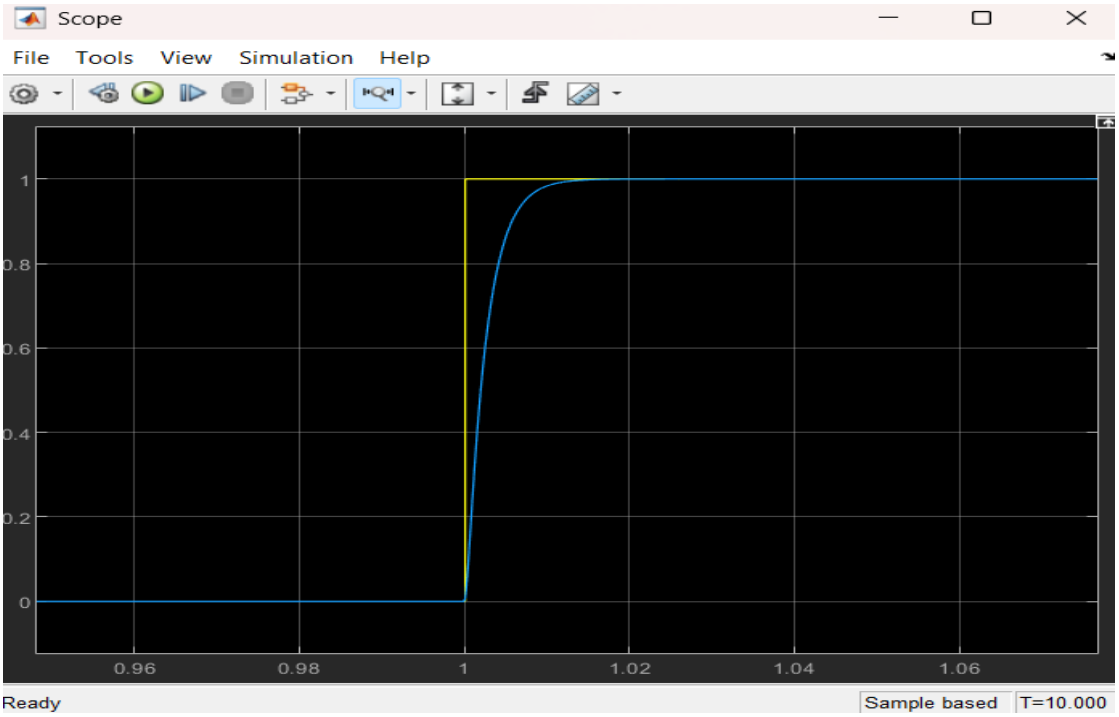


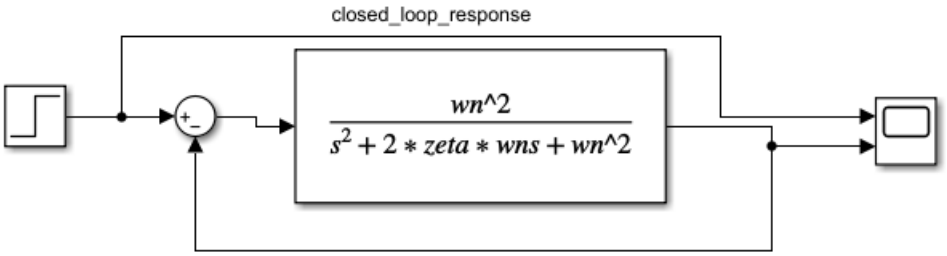
After try and error I was able to reach to this system response with no overshoot and steady state error equal to zero

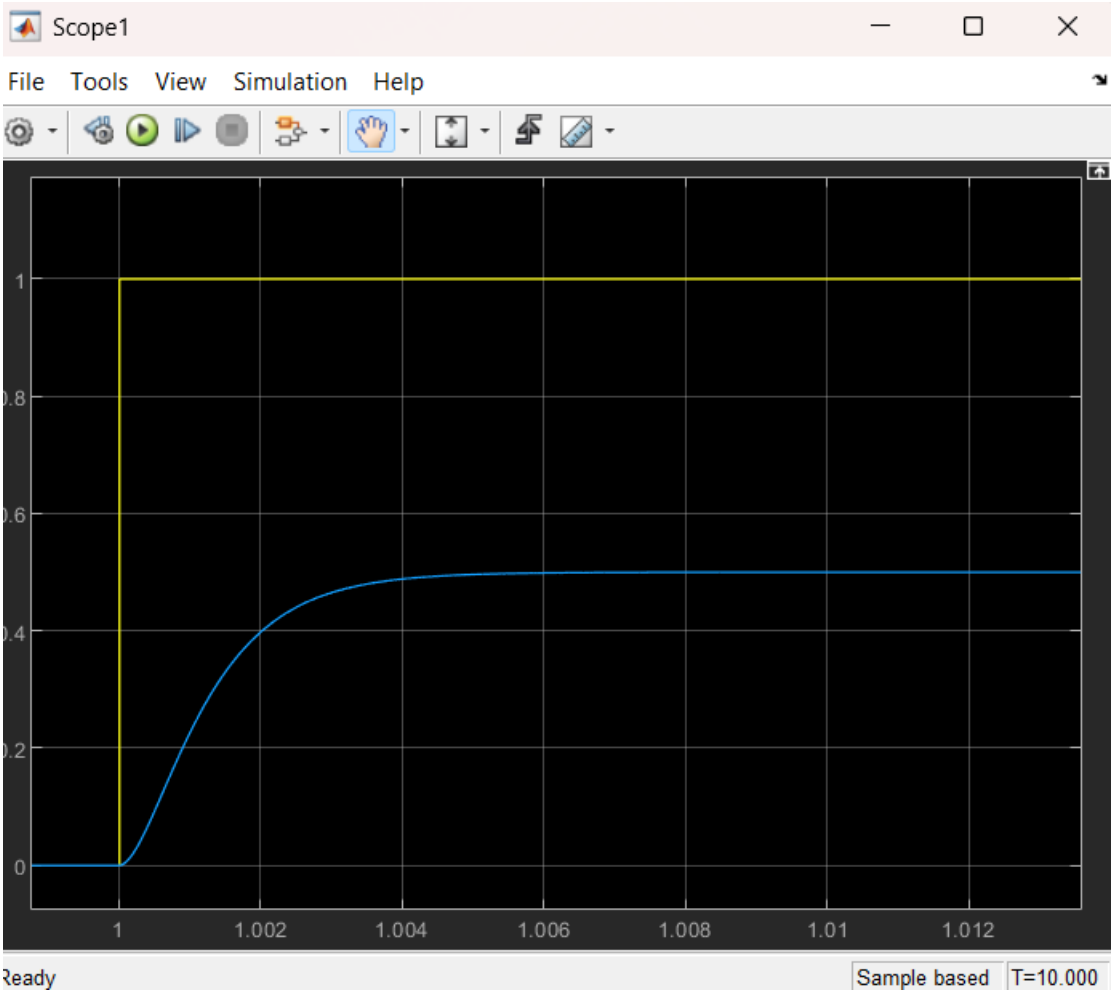
Case 3

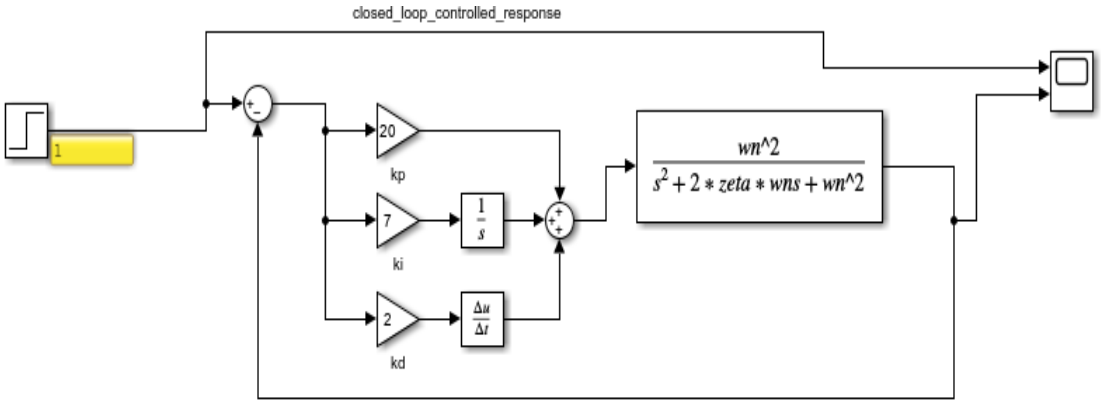
```
%second_order_system
%CASE3
R1=3000;
R2=3000;
C1=0.3e-6;
C2=0.3e-6;
wn=1/(R1*C1);
zeta =((R1*C1)+(R1*C2)+(R2*C2))/(2*wn*(R1*R2*C1*C2));
```

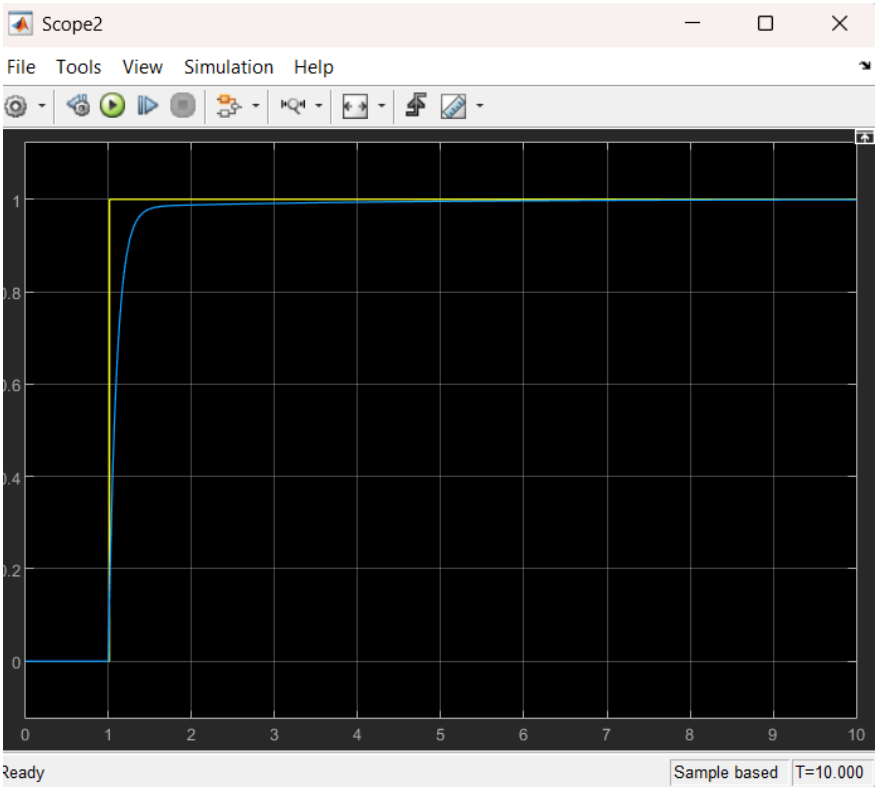





closed_loop_response
wn^2
s^2 + 2 * zeta * wns + wn^2


Scope1
File Tools View Simulation Help
1
0.8
0.6
0.4
0.2
0
1
1.002
1.004
1.006
1.008
1.01
1.012
Ready
Sample based
T=10.000





After try and error I was able to reach to this system response with no overshoot and steady state error equal to zero