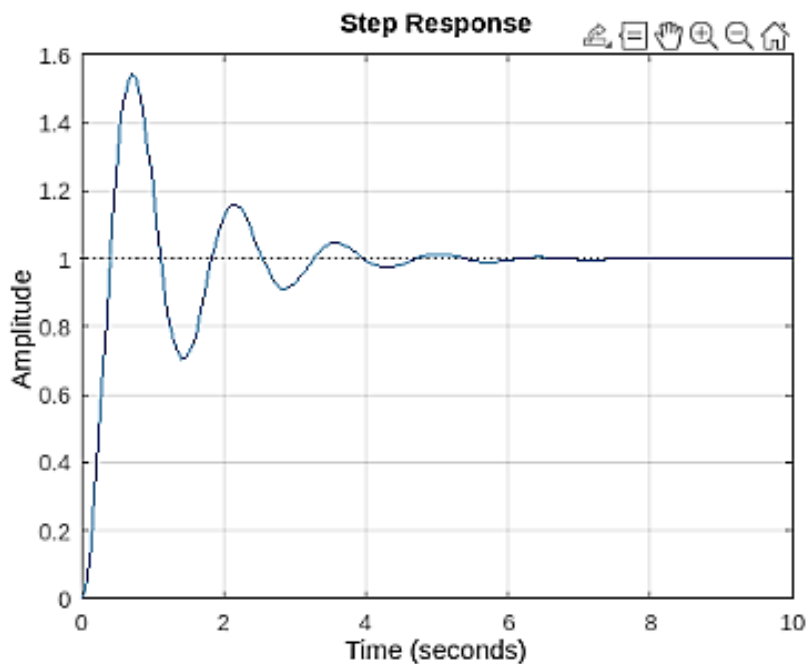


1. WITHOUT CONTROLLER

Code:

```
num=20;% Setting the numerator of the transfer function
den=[1 1.7 20];% Setting the denominator of the transfer function
gain=tf(num,den);% Creating the transfer function object
step(gain);% Generating the step response
xlim([0,10]);% Setting the x-axis limits for the plot
grid on;% Adding a grid to the plot for better readability
info=stepinfo(gain);% Calculating the step response information
[resp, t]=step(gain);% Getting the step response data
value=resp(end);% Getting the final value of the step response
err=abs(1-value);% Calculating the error between the final value and 1
disp(err);% Displaying the error
```

Output:



1x1 struct with 9 fields	
Field	Value
RiseTime	0.2681
TransientTime	4.4547
SettlingTime	4.4547
SettlingMin	0.7052
SettlingMax	1.5436
Overshoot	54.3644
Undershoot	0
Peak	1.5436
PeakTime	0.7043

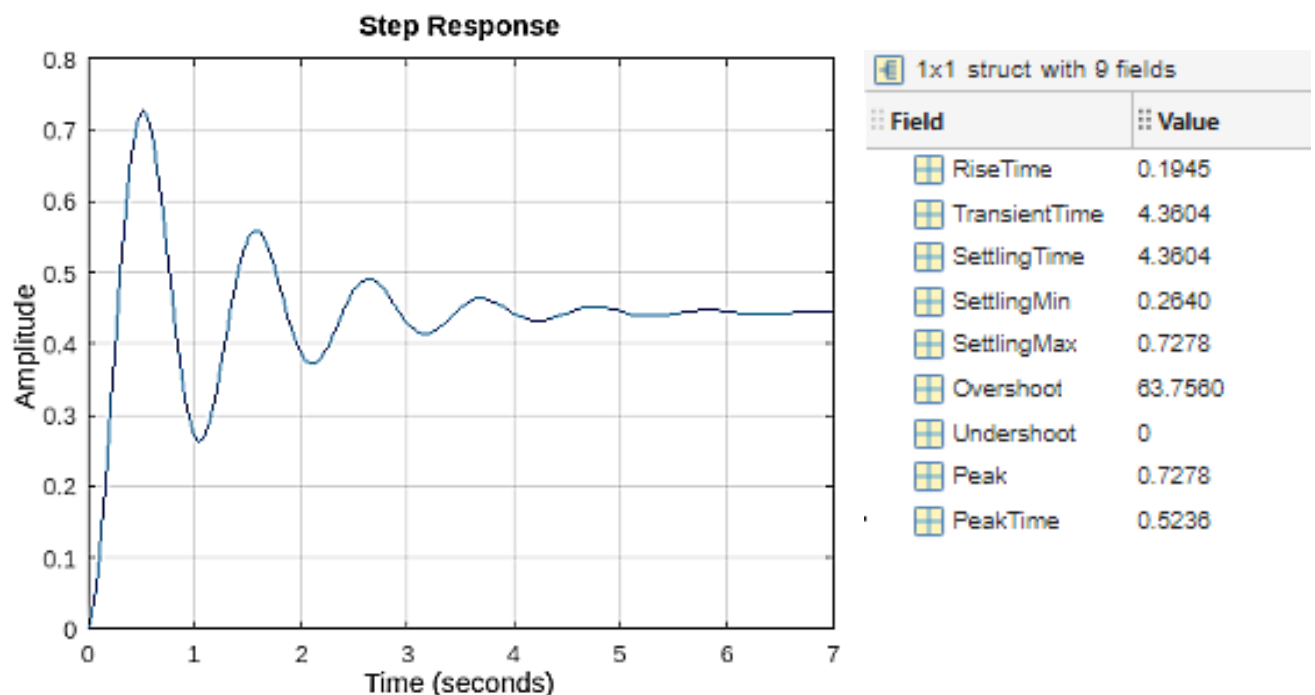
err = 1.9636e-04

2. WITH P CONTROLLER

Code:

```
num=20;% Set the numerator of the transfer function
den=[1 1.7 20];% Set the denominator of the transfer function
gain=tf(num,den);% Create the transfer function object
convertor=tf([0 0.8 0],[1 0]);% Create the converter transfer function
x=series(gain,convertor);% Connect the original transfer function and the
converter in series
y=feedback(x,1);% Create the closed-loop system with unity feedback
xlim([0,10]);% Set the x-axis limits for the plot
step(y);% Generate the step response of the closed-loop system
grid on;% Add a grid to the plot
info=stepinfo(y);% Calculate the step response information
[resp, t]=step(y);% Get the step response data
value=resp(end);% Get the final value of the step response
err=abs(1-value);% Calculate the error between the final value and 1
disp(err);% Display the error
```

Output:



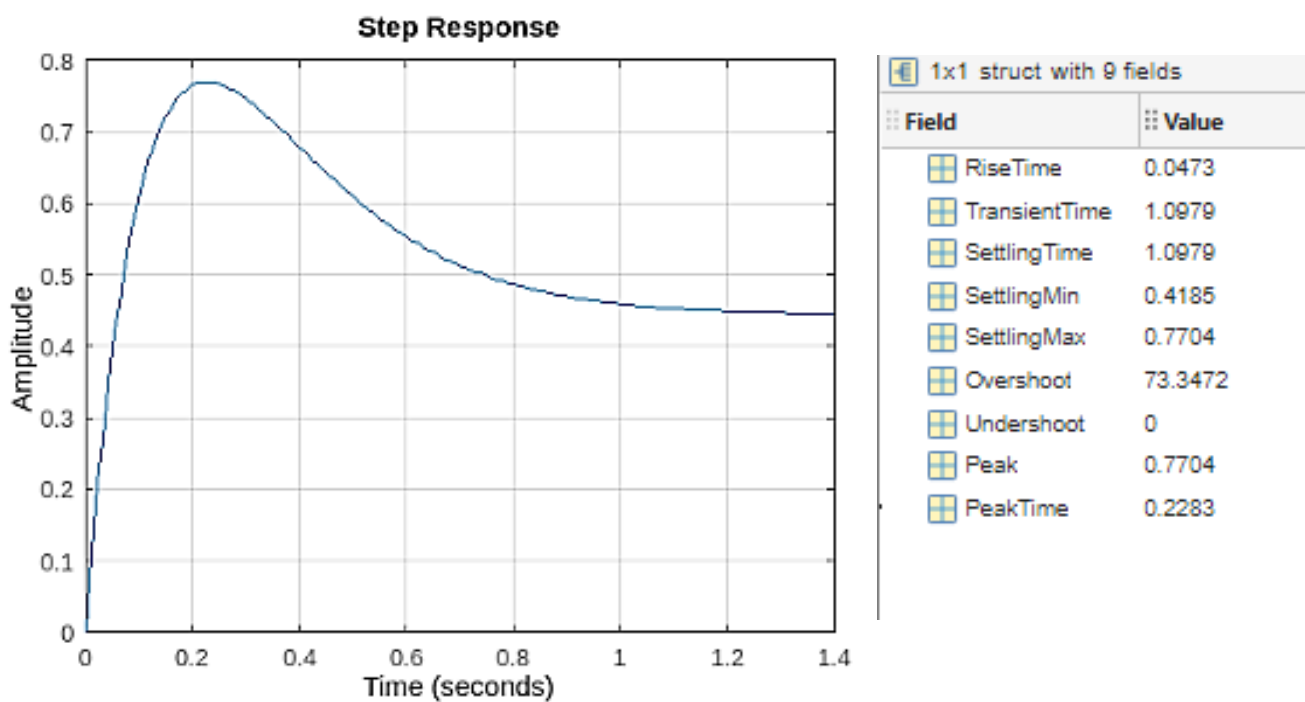
err = 0.5559

3. WITH PD CONTROLLER

MATLAB Code:

```
num=20;  
den=[1 1.7 20];  
gain=tf(num,den);  
convertor=tf([0.5 0.8 0],[1 0]);  
x=series(gain,convertor);  
y=feedback(x,1);  
xlim([0,10]);  
step(y);  
grid on;  
info=stepinfo(y);  
[resp, t]=step(y);  
value=resp(end);  
err=abs(1-value);  
disp(err);
```

Output:



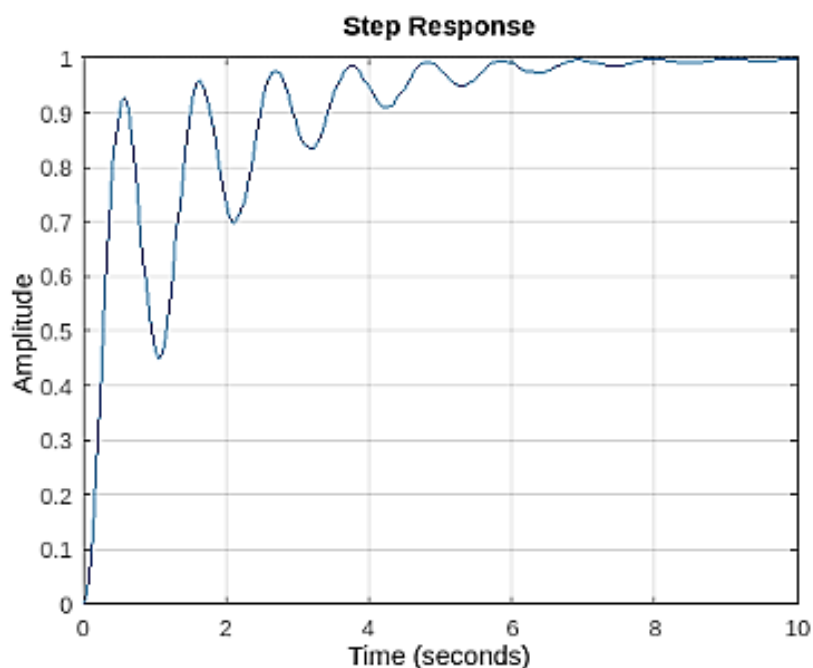
err = 0.5536

4. WITH PI CONTROLLER

MATLAB Code:

```
num=20;  
den=[1 1.7 20];  
gain=tf(num,den);  
convector=tf([0.8 0.99],[1 0]);  
x=series(gain,convector);  
y=feedback(x,1);  
xlim([0,10]);  
step(y);  
grid on;  
info=stepinfo(y);  
[resp, t]=step(y);  
value=resp(end);  
err=abs(1-value);  
disp(err);
```

Output:



1x1 struct with 9 fields	
Field	Value
RiseTime	0.3911
TransientTime	8.5890
SettlingTime	8.5890
SettlingMin	0.4508
SettlingMax	0.9995
Overshoot	0
Undershoot	0
Peak	0.9995
PeakTime	10.1434

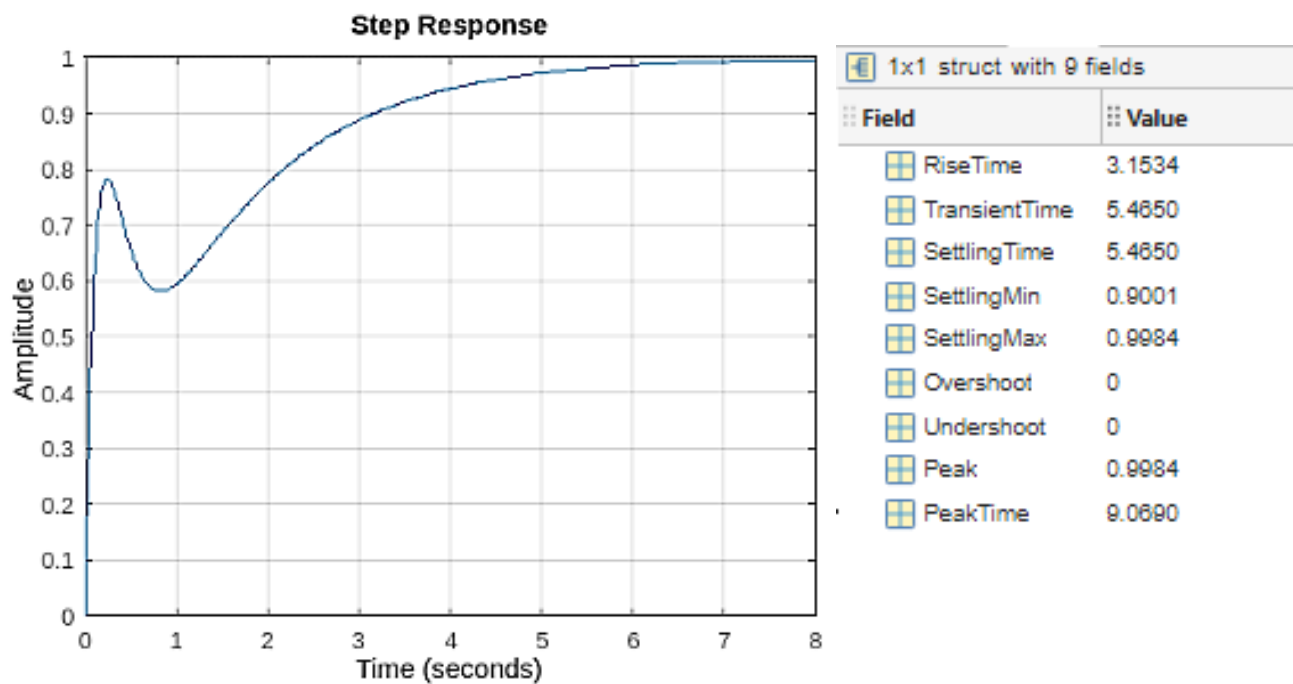
err = 8.7180e-04

5. WITH PID CONTROLLER

MATLAB Code:

```
num=20;  
den=[1 1.7 20];  
gain=tf(num,den);  
convertor=tf([0.5 0.8 0.99],[1 0]);  
x=series(gain,convertor);  
y=feedback(x,1);  
xlim([0,10]);  
step(y);  
grid on;  
info=stepinfo(y);  
[resp, t]=step(y);  
value=resp(end);  
err=abs(1-value);  
disp(err);
```

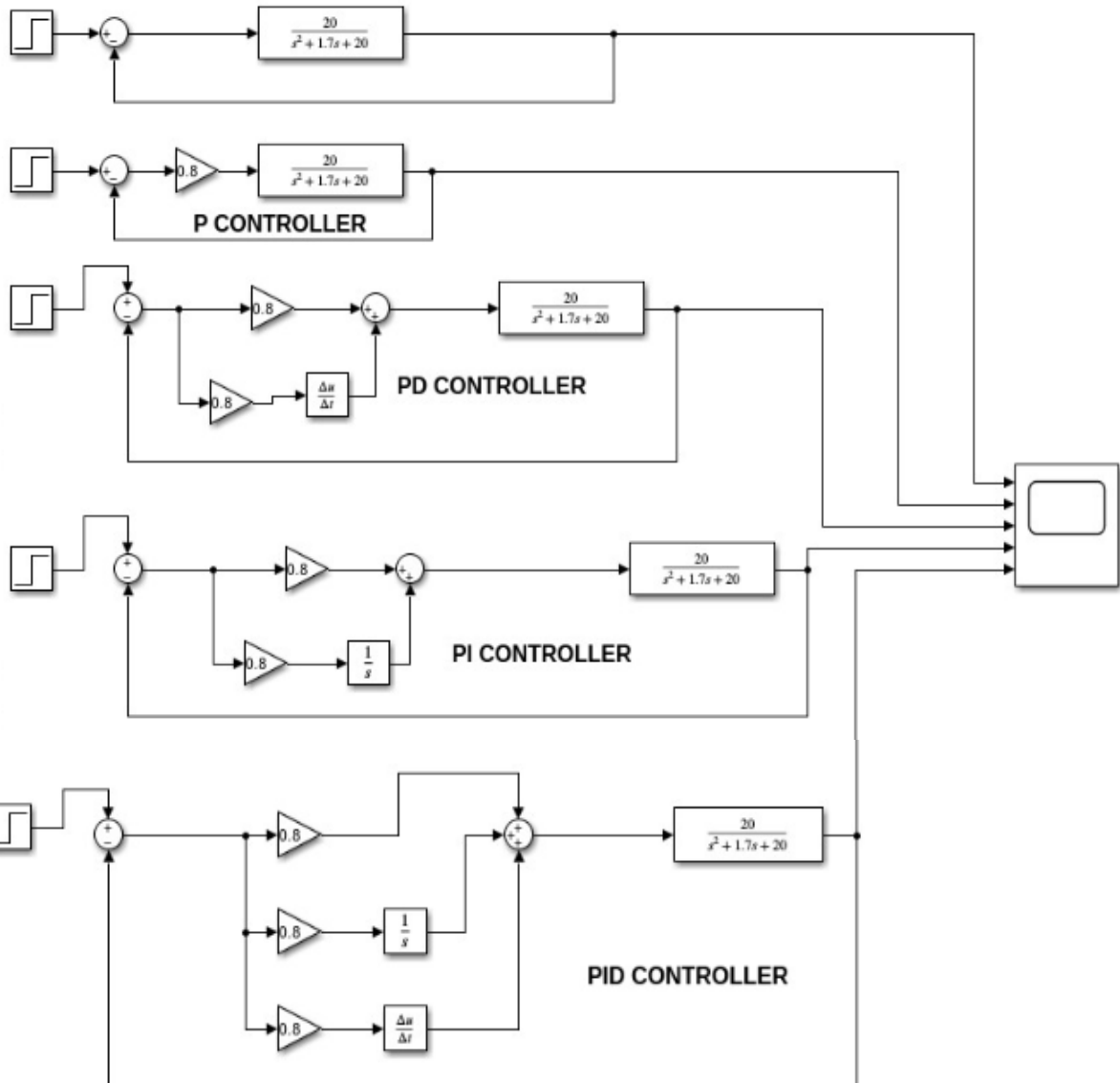
Output:



err = 0.0038

P, PD, PI, PID CONTROLLERS USING SIMULINK

WITHOUT CONTROLLER



Output:

