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%% Michael Maher ID: 45935452 HW8 Code

clear
close all
clc

%% P Controller Parameters
kp1 = 3;

%% PI Controller Parameters
kp2 = 1.36;
ki2 = 0.402;

%% PID Controller Parameters
kp3 = 4.145;
ki3 = 1.52;
kd3 = 7;

%% Get Respective Transfer Functions
sys_p = tf(kp1,[1 3 3 1+kp1]);
sys_pi = tf([kp2 ki2],[1 3 3 1+kp2 ki2]);
sys_pid = tf([kd3 kp3 ki3],[1 3 3+kd3 1+kp3 ki3]);

%% Step Info of Each
Sp = stepinfo(sys_p,'RiseTimeThreshold',[0 1]);
Spi = stepinfo(sys_pi,'RiseTimeThreshold',[0 1]);
Spid = stepinfo(sys_pid,'RiseTimeThreshold',[0 1]);

disp('P Controller')
disp('-------------')
spspec1 = ['Rise Time: ', num2str(Sp.RiseTime), ' seconds']
spspec2 = ['Peak Time: ', num2str(Sp.PeakTime), ' seconds']
spspec3 = ['Max Peak Overshoot: ', num2str(Sp.Overshoot), ' %']
spspec4 = ['Settling Time: ', num2str(Sp.SettlingTime), ' seconds']

disp('PI Controller')
disp('-------------')
spspec1 = ['Rise Time: ', num2str(Spi.RiseTime), ' seconds']
spspec2 = ['Peak Time: ', num2str(Spi.PeakTime), ' seconds']
spspec3 = ['Max Peak Overshoot: ', num2str(Spi.Overshoot), ' %']
spspec4 = ['Settling Time: ', num2str(Spi.SettlingTime), ' seconds']

disp('PID Controller')
disp('-------------')
spspec1 = ['Rise Time: ', num2str(Spid.RiseTime), ' seconds']
spspec2 = ['Peak Time: ', num2str(Spid.PeakTime), ' seconds']
spspec3 = ['Max Peak Overshoot: ', num2str(Spid.Overshoot), ' %']
spspec4 = ['Settling Time: ', num2str(Spid.SettlingTime), ' seconds']
```

```
%% Plots
step(sys_p)
hold off
step(sys_pi)
hold off
step(sys_pid)
```