ME360: FUNDAMENTALS OF SIGNAL PROCESSING, INSTRUMENTATION AND CONTROL

Laboratory No. 6 − PID Control and the Parker-Hannifin Hydraulic Station Data Sheet

PID control of a hydraulic piston-cylinder assembly

Using the pressure setting and the cylinder dimensions, calculate the maximum force available for extension. Repeat the calculations for retraction. (5 pts.)

In the table below, indicate the effects (increase, decrease, or same) of the proportional gain K_p, integral gain K_I, and derivative gain K_d on the rise time, settling time, overshoot and steady-state error in the response. (20 pts.)

	Rise Time	Settling Time	Overshoot	Steady-state Error
Proportional Gain (K_p)				
Integral Gain (K_I)				
Derivative Gain (K_d)				

Is there an upper limit on Kp above which the control has an adverse effect on the system's response? If yes, describe the adverse effect and give the upper limit value for Kp. (5 pts.)

Record the PID gains to achieve $e_{ss} = 0$, %OS = 0%, $t_r \approx 1.5$ s. Sketch/Plot the actual and desired response and indicate the s.s. error, overshoot (if any), rise time and settling time on your sketch. (20 pts.)

Record the PID gains to achieve $e_{ss} = 0$, %OS = 1%, $3.0 \leq t_r \leq 4.0$ s. Sketch the actual and desired response and indicate the s.s. error, overshoot (if any), rise time and settling time on your sketch. (20 pts.)