Signals and Systems 310 Laboratory
Design of PID Controllers (Lab 4)

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1 Aim

The aim of this experiment is to design a PID controller for a system described by a second-order transfer function.

2 PID Controller Tutorial

Please read the PID tutorial on the web:

http://www.engin.umich.edu/group/ctm/PID/PID.html

3 Procedure

1. In the transfer function model given on page 3 of the web site, let

\[ M = 1 \, Kg \quad b = 2 \, N.s/m \]
\[ k = 17 \, N/m \quad F(s) = 1 \]

2. Plot the open-loop response. Comment on the response and also determine what needs to be improved.

3. Add a proportional control to improve its rise time.

4. Add a derivative control to improve its overshoot.

5. Add an integral control to eliminate the steady-state error.

6. Adjust the parameters of PID controllers namely \( K_p \), \( K_i \) and \( K_d \) until you obtain a desired overall response.

7. At each step, plot the response of the closed-loop system and comment. Also calculate the closed-loop poles and comment.

4 References