

Control Systems Course, Academic Year 2011-2012

Ing. A. D’Innocenzo and Ing. G. Pola

Part 1 test, February 23rd 2012

Available time: 2h

Ex1 Given a plant characterized by the transfer function

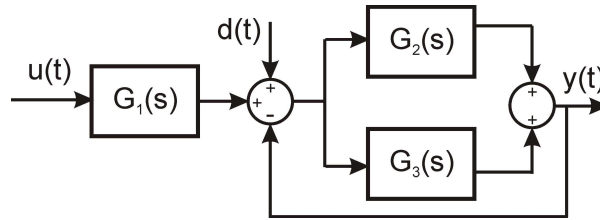
$$G(s) = \frac{1}{s(s-4)},$$

design a control scheme and a controller $G_c(s)$ such that:

1. the closed loop system is astatic with respect to a ramp additive disturbance applied to the output of the plant $G(s)$;
2. the steady state error with respect to a ramp input is smaller than 0.1;
3. the settling time T_s is smaller or equal to 3 s;

Compute the output time signal of the obtained closed loop system for a step reference signal.

Ex2 Given a plant characterized by the following block diagram model



where $G_1(s) = \frac{1}{2s+1}$, $G_2(s) = \frac{1}{s-2}$ and $G_3(s) = \frac{1}{s+3}$, derive the transfer function $G(s) = \frac{Y(s)}{U(s)}$ and design a control scheme and a controller $G_c(s)$ such that:

1. the closed loop system is astatic with respect to the step additive disturbance $d(t)$;
2. the steady state error with respect to a ramp input is smaller than 0.1.

Ex3 Discuss the design specifications on the transient response of a feedback control system, and provide one illustrative example.

Note: At the end of the exam you can decide either to give us your test or not. If you give us your test, your mark obtained in a previous test, regarding this part of the Control System course, is directly replaced by the mark obtained in the current test.