Control Systems Course, Academic Year 2011-2012

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Part 1 test, February 17^{th} 2012

Available time: 2h

Ex1 Given a plant characterized by the transfer function

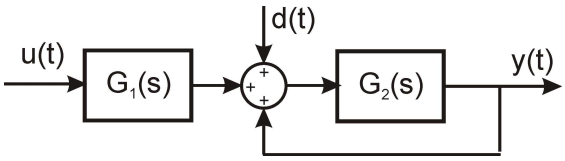
$$G(s) = \frac{s+1}{(s-10)},$$

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

1. the closed loop system is astatic with respect to a step 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 0.1 s;

Compute the percent overshoot of the obtained system.

Ex2 Given a plant characterized by the following block diagram model



where $G_1(s) = \frac{1}{s}$ and $G_2(s) = \frac{1}{s}$, 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 parabola input is smaller than 10^{-3}.

Discuss the steady state behavior of the system with respect to polynomial additive disturbances applied to the output of the plant.

Ex3 Discuss the stability property of linear feedback systems and the Routh-Hurwitz stability criterion, 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.