System Modeling, Dynamics and Control

Tutorial 6, Autumn Semester, 2006

1. A unity feedback closed-loop system consists of a proportional controller $H(s) = K$ and the transfer function $G(s) = (s+2)(s^4 + 7s^3 + 15s^2 + 25s)^{-1}$ in the forward path. Find the range of values of K which yields a stable closed-loop.

2. Find the number of roots of the polynomial $s^4 + 10s^3 + 36s^2 + 70s + 75$ that have real parts between -2 and 0.

3. Design a controller for the system $G(s) = (s^2 + s + 1)^{-1}(s+2)^{-1}$ such that the closed-loop system responds with zero steady state error to step inputs.

4. For what values of K is the closed-loop system having $G(s) = [s^2(Ts+1)]^{-1}$ and $H(s) = K$ stable? Repeat in the case where derivative control ($H(s) = Ks$) is used.

5. Determine the closed-loop stability of a unity feedback system having the open-loop transfer function $G(s) = K(1-s)/(s+1)$.

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