UNIVERSITY OF TORONTO
Department of Electrical and Computer Engineering
ELE 356S Spring 1999
Problem Set #9

Review Problems

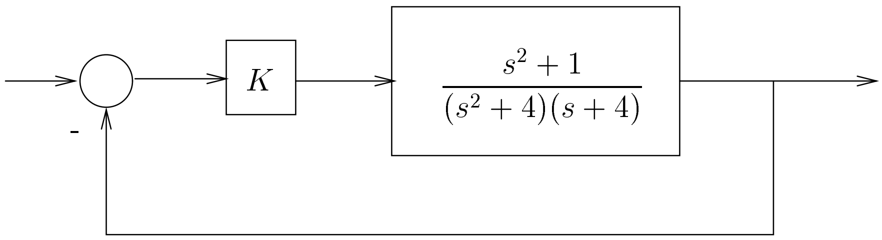
1. A discrete-time linear time-invariant system has an impulse response sequence

$$\begin{aligned} h_k &= \left(\tfrac{1}{2}\right)^k & k \geq 0 \\ &= 0 & k < 0 \end{aligned}$$

Using z-transforms, find the output of the system if the input is a unit step, i.e.

$$\begin{aligned} u_k &= 1 & k \geq 0 \\ &= 0 & k < 0 \end{aligned}$$

2. Sketch the Nyquist plot of the system described by the transfer function $P(s) = \dfrac{s^2+1}{(s^2+4)(s+4)}$. Based on the Nyquist plot, determine the range of values of the gain K for which the feedback system



is stable.

3. Suppose a low pass digital filter is to be designed so that the maximum ripple δ is .05%, with a transition width $\Delta = 0.1\pi$. If the maximum allowable length of the filter is 71, can the above design specs be met using a nonrecursive filter designed with the Kaiser window?