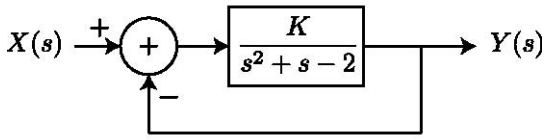
Signals and Systems

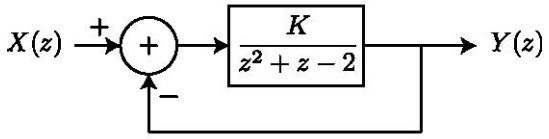
Homework Assignment #7

Problem 1. Consider the following feedback system in which the box represents a causal LTI CT system that is represented by its system function.



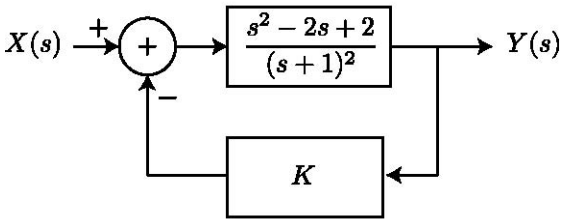
a. Determine the range of K for which this feedback system is BIBO stable.
b. Determine the range of K for which this feedback system has real-valued poles.

Problem 2. Consider the following feedback system in which the box represents a causal LTI DT system that is represented by its system function.



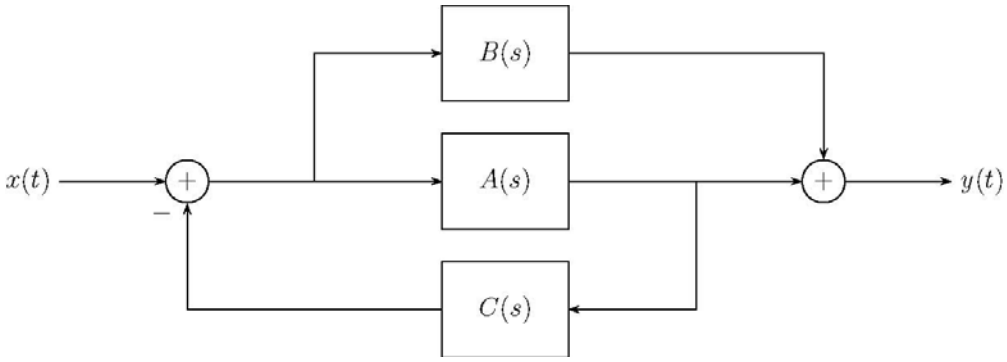
a. Determine the range of K for which this feedback system is BIBO stable.
b. Determine the range of K for which this feedback system has real-valued poles.

Problem 3. Consider the following feedback system in which the boxes represent causal LTI CT systems that are represented by their system functions.



a. Determine an analytic expression for the closed-loop poles of the system (as a function of K).
b. Find the range of K such that the closed-loop system is stable.
c. There is a value of K such that the impulse response of the closed-loop system is an everlasting oscillation. Find the frequency of this oscillation.

Problem 4. Consider the following block diagram:



Find the transfer function H(s) = Y(s)/X(s) of the overall system in terms of A(s), B(s) and C(s). Note that the adder on the left side has one minus sign.