ELEC-E8116 Model-based control systems /exercises 5

Problem 1. Consider the process

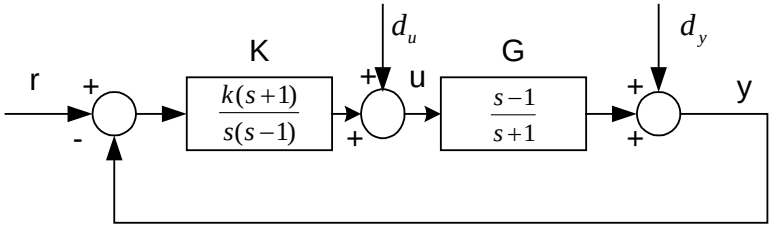
$$G(s) = \frac{3(-2s+1)}{(5s+1)(10s+1)}$$

which is controlled by the *PI*-controller

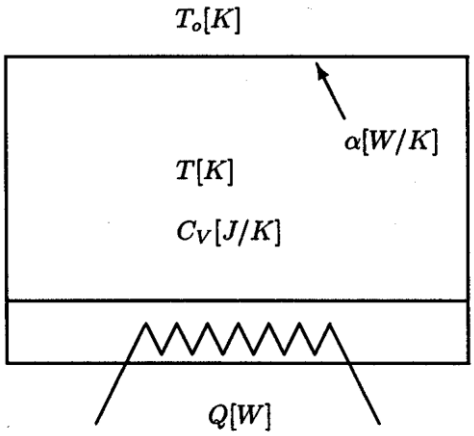
$$K(s) = 1.136(1 + \frac{1}{12.7s})$$

Plot the *L*-, *S*- and *T*-curves. Determine the gain crossover frequency, gain and phase margins and bandwidth.

Problem 2. Consider the control configuration in the figure, in which the parameter *k* is positive. Is the system internally stable?



Problem 3. Consider the apartment heating system shown in the figure. The aim is to control the incoming heat such that the room temperature is as desired with the accuracy of one Kelvin. The outdoor temperature is a disturbance.



a. Derive a model of the system and linearize it.
b. Scale the model in such a way that the transfer functions related to the process and disturbance are comparable with each other.