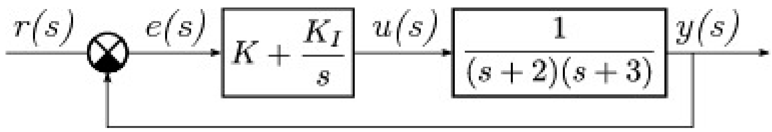
ARI 2015 – Homework 4

Assignment 1 – Routh table

Determine the intervals of the gains K, KI of the cascade compensator, such that the closed-loop system shown below is stable. Use Routh-Hurwitz criterion.



a) Explain the key steps in the calculations and show important intermediate results.
b) Draw in the plane K, KI the region for which the system is stable.

Assignment 2 – rltool

Using the function hw_4_std generate a model of the second-order system with two poles and no zero. The form of the system is

$$G(s) = \frac{1}{(s+a)(s+b)}.$$

The syntax of hw_4_std is the following

G = hw_1_std(dd, mm, yy);

Inputs:

dd – day of your birthday, for instance, 03

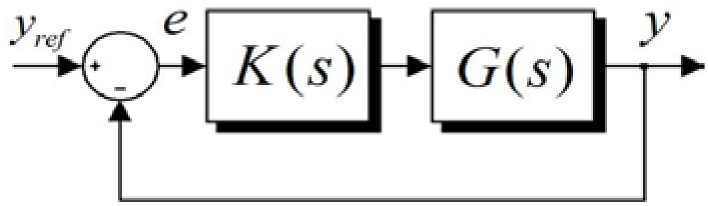
mm – month of your birthday, for instance, 11

yy – last two digits of the year of your birth, for example 89

Outputs:

G – the model of the system

Consider the feedback system



with a controller

$$K(s) = K_p + \frac{K_I}{s}.$$

a) For the given system design the constants $K_p > 0, K_I > 0$ of the controller using the root-locus roles. Use rltool in Matlab. The goal is to place the poles as far away to the left (far from the imaginary axis) as possible. The damping factor must be kept at $\zeta = 0.7$.
b) Explain your approach and show key intermediate steps.
c) Plot the step response of the closed-loop.
d) What is the steady-state regulation error?