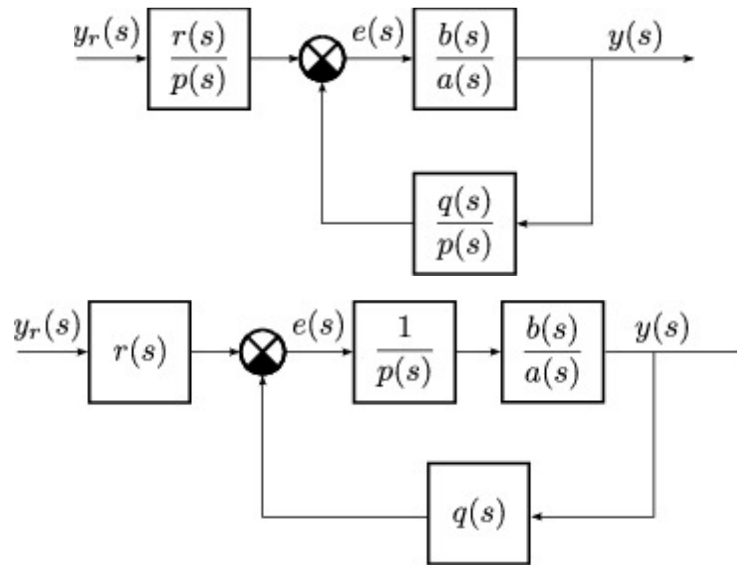


ARI 2015 – Homework 5

Assignment 1 – Feedback

Compare two systems shown below.



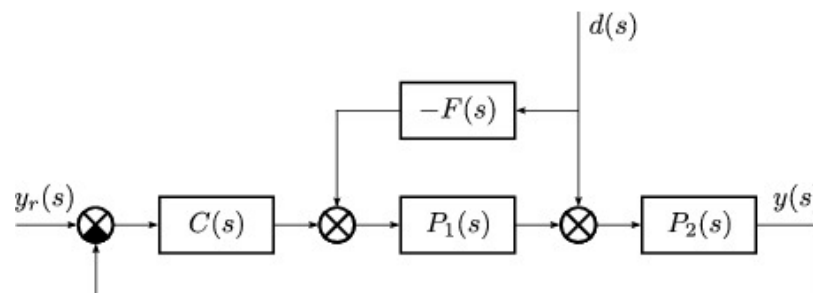
Find out, what is their difference in terms of stability. Hint: determine internal stability conditions of each of the system and compare these conditions. Explain the difference.

Assignment 2 – Feedforward

The response of the system $P(s)$ is affected by a disturbance. The transfer function $P(s) = P_1(s)P_2(s)$ is given by

$$P_1(s) = \frac{s+2}{s+1}, P_2(s) = \frac{1}{s-1}.$$

The disturbance enters the system in the middle – between $P_1(s)$ and $P_2(s)$, as shown in the following figure



This disturbance is measurable before it enters the plant $P_2(s)$. The control input is at the input of the system $P_1(s)$.

Design both the feedforward compensator $F(s)$ and the feedback controller $C(s)$ such that the closed-loop system is stable and the effect of the disturbance on the output y is minimized.

Hint: First calculate the transfer function from the disturbance to the output. In this special case this transfer function can be easily transformed to zero by finding the compensator F . Then design a feedback controller $C(s)$.