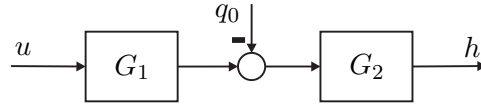## Exercise Sheet 12: Disturbance Feedforward

Problem 25:

We again consider the *one-tank* system in Problem 18 and recall that the plant can be represented by the following block diagram with the transfer functions $G_1(s) = \dfrac{K_1}{1 + sT_1}$ and $G_2(s) = \dfrac{1}{As}$ ($A = .1\,\mathrm{m}^2$, $T_1 = 3\,\mathrm{sec}$ and $K_1 = 0.03\,\mathrm{m}^3/\mathrm{sec/V}$).

a. Design a controller such that the closed-loop poles lie at $s = -1\,\mathrm{rad/sec}$ and the steady state error for disturbance steps is zero. Use pole placement.

b. We now assume that q_0 can be measured. Sketch the feedback loop for the tank system including a disturbance feedforward

c. Determine a possible choice for the disturbance feedforward transfer function $G_d(s)$

d. Compare the disturbance step responses for a disturbance step of $q_0 = 0.01\,\mathrm{m}^3/\mathrm{sec}$ for the controller designs in a. and c. using Simulink.