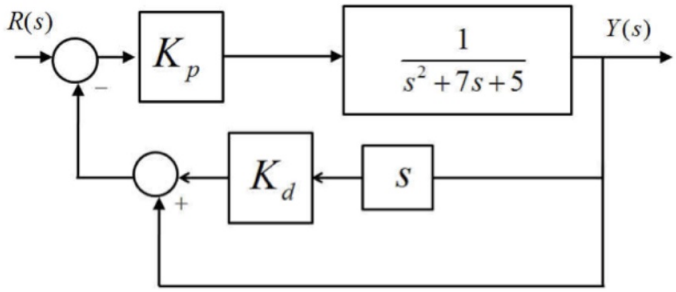
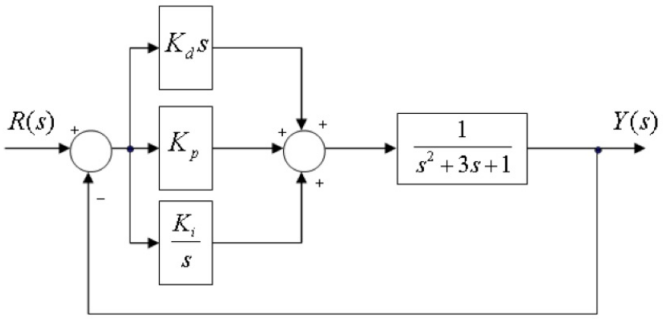
SFWR ENG 3DX4 – Assignment 2

1. Consider the following system:



   Using the properties of second-order systems, determine K_p and K_d such that the overshoot is 10 percent and the settling time is 1 second. Confirm that your design meets the requirements by plotting the step response in Matlab.

2. Consider the following system (similar to Lab 1):



   (a) If $K_d = K_p = K_i = 1$, is the system stable? (Please determine this by explicitly finding the poles of the closed-loop system and reasoning about stability based on the pole locations.)

   (b) Fix $K_i = 10$. Using the Routh-Hurwitz criterion, determine the ranges of K_p and K_d that result in a stable system.

3. For the system in the first question, suppose that you want the steady-state error to be 10%. What should the values of K_p and K_d be? (Hint: the system is not in the unity gain form that we discussed in detail in lecture, so be careful.)