

Control y Sistemas

Trabajo práctico: Controladores PID

Resuelva los siguientes ejercicios en MATLAB o SIMULINK.

1) B-8-2. Consider the system shown in Figure 8-71. Assume that disturbances $D(s)$ enter the system as shown in the diagram. Determine parameters K , a , and b such that the response to the unit-step disturbance input and the response to the unit-step reference input satisfy the following specifications: The response to the step disturbance input should attenuate rapidly with no steady-state error, and the response to the step reference input exhibits a maximum overshoot of 20% or less and a settling time of 2 sec.

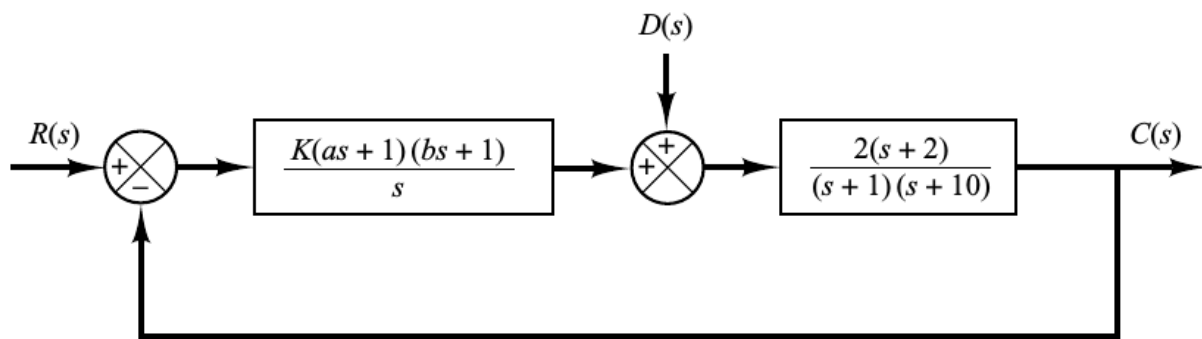
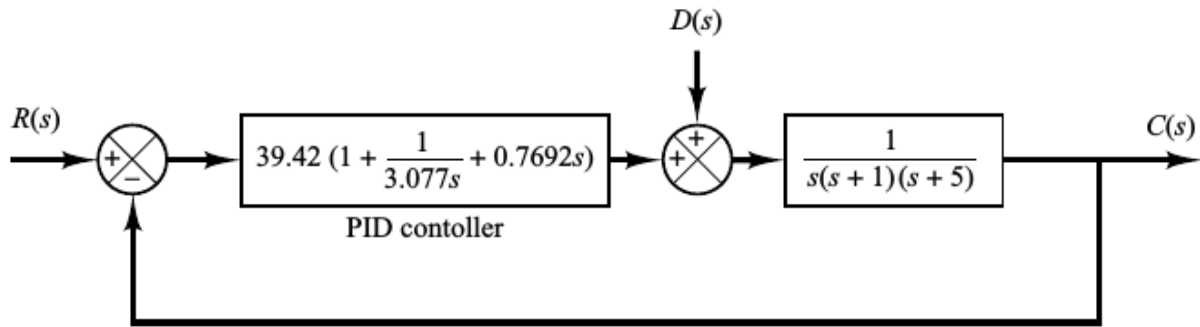


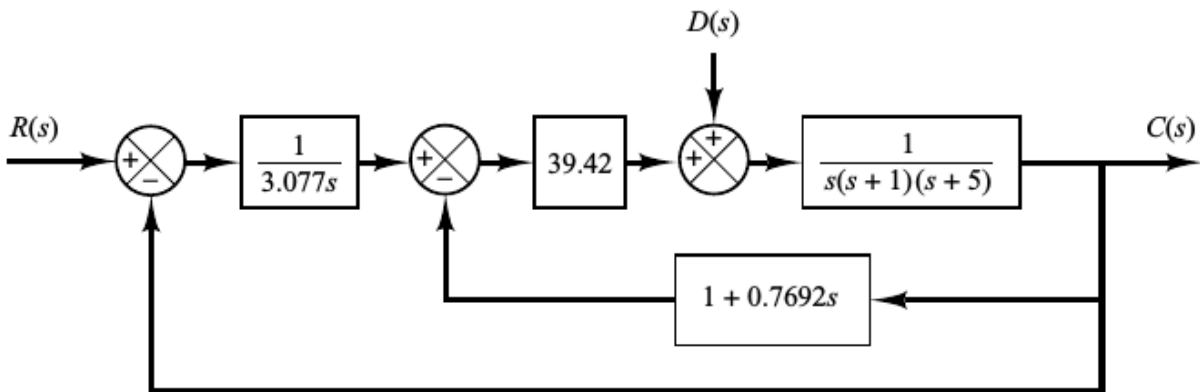
Figure 8-71
Control system.

2) B-8-4. Consider the systems shown in Figures 8-73(a) and (b). The system shown in Figure 8-73(a) is the system designed in Example 8-1. The response to the unit-step reference input in the absence of the disturbance input is shown in Figure 8-10. The system shown in Figure 8-73(b) is the I-PD-controlled system using the same K_p , T_i , and T_d as the system shown in Figure 8-73(a). Obtain the response of the I-PD-controlled system to the unit-step reference input with MATLAB. Compare the unit-step response curves of the two systems.

3) B-8-5. Referring to Problem B-8-4, obtain the response of the PID-controlled system shown in Figure 8-73(a) to the unit-step disturbance input. Show that for the disturbance input, the responses of the PID-controlled system shown in Figure 8-73(a) and of the I-PD-controlled system shown in Figure 8-73(b) are exactly the same. [When considering $D(s)$ to be the input, assume that the reference input $R(s)$ is zero, and vice versa.] Also, compare the closed-loop transfer function $C(s)/R(s)$ of both systems.



(a)



(b)

Figure 8–73

(a) PID-controlled system; (b) I-PD-controlled system.

4) B–8–14. Consider the system shown in Figure 8–81. The plant $G_p(s)$ is given by

$$G_p(s) = \frac{2(s+1)}{s(s+3)(s+5)}$$

Determine the controllers $G_{c1}(s)$ and $G_{c2}(s)$ such that, for the step disturbance input, the response shows a small amplitude and approaches zero quickly (in a matter of 1 to 2 sec). For the response to the unit-step reference input, it is desired that the maximum overshoot be 20% or less and the settling time 1 sec or less. For the ramp reference input and acceleration reference input, the steady-state errors should be zero.

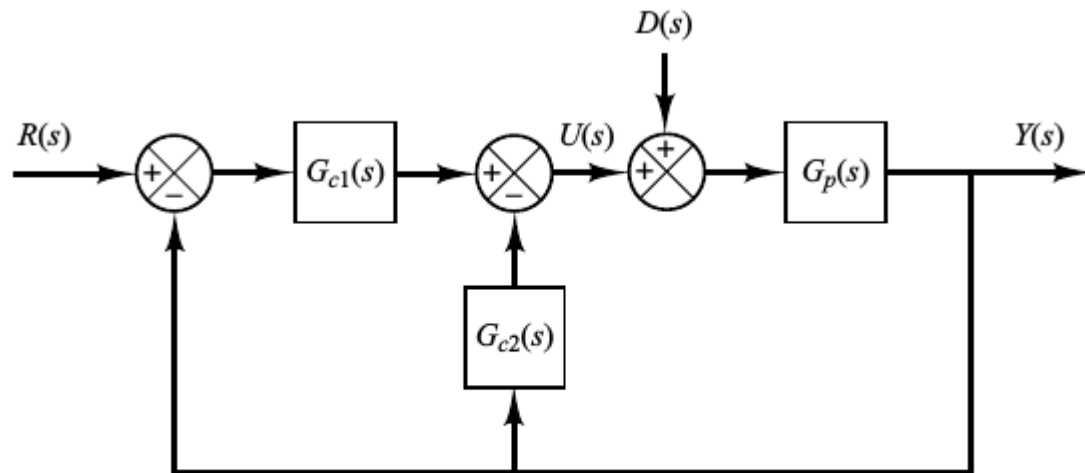


Figure 8–81
Two-degrees-of-freedom control system.