IBEHS 4A03 Assignment #3
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1. Question 1

(1.1) The open-loop step response of the system is shown in the Simulink model (Figure 1) below with the response shown in Figure 2.

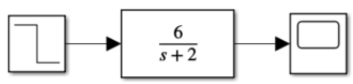

Figure 1: Simulink model of the open-loop step response

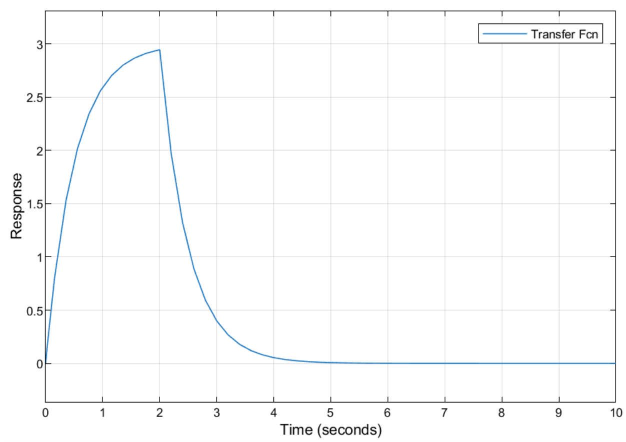

Figure 2: Open-loop step response

To identify the gain and time constant for this system, we can rearrange the transfer function to isolate the gain K and time constant τ:

The given transfer function is:

$$G_p(s) = \frac{6}{s+2}$$

To express this in the standard first-order form, which is:

$$G(s) = \frac{K}{\tau s + 1}$$

where K is the gain and τ is the time constant.
We rearrange $G_p(s)$ as follows:

$$G_p(s) = \frac{6}{2(\frac{1}{2}s + 1)} = \frac{3}{\frac{1}{2}s + 1}$$

Thus, we identify the gain K and the time constant τ as:

$$K = 3, \quad \tau = \frac{1}{2}$$

(1.2) The closed-loop feedback control with a proportional controller is shown below in Figure 3. The transfer function $G_c(s)$ can also be represented by a proportional gain K_c.

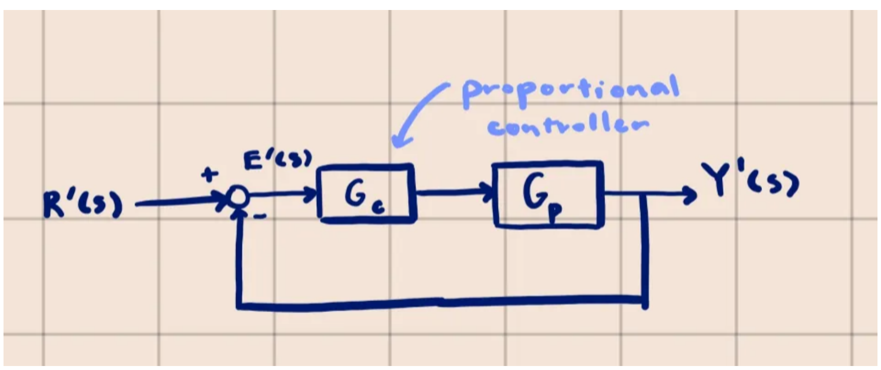

Figure 3: Simulink model of the closed-loop feedback control with a proportional controller

(1.3) The Simulink model is shown below in Figure 4. The response of the system is shown in Figure 5.

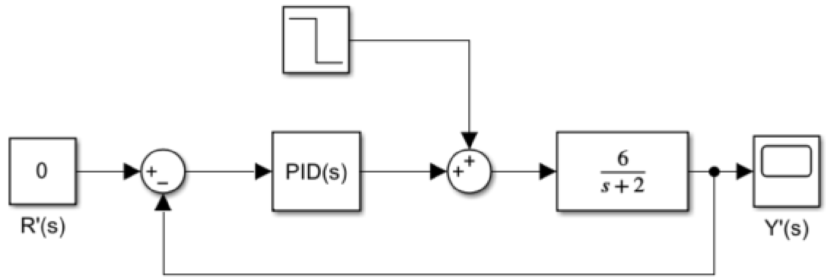

Figure 4: Simulink model of the closed-loop feedback control with a proportional controller

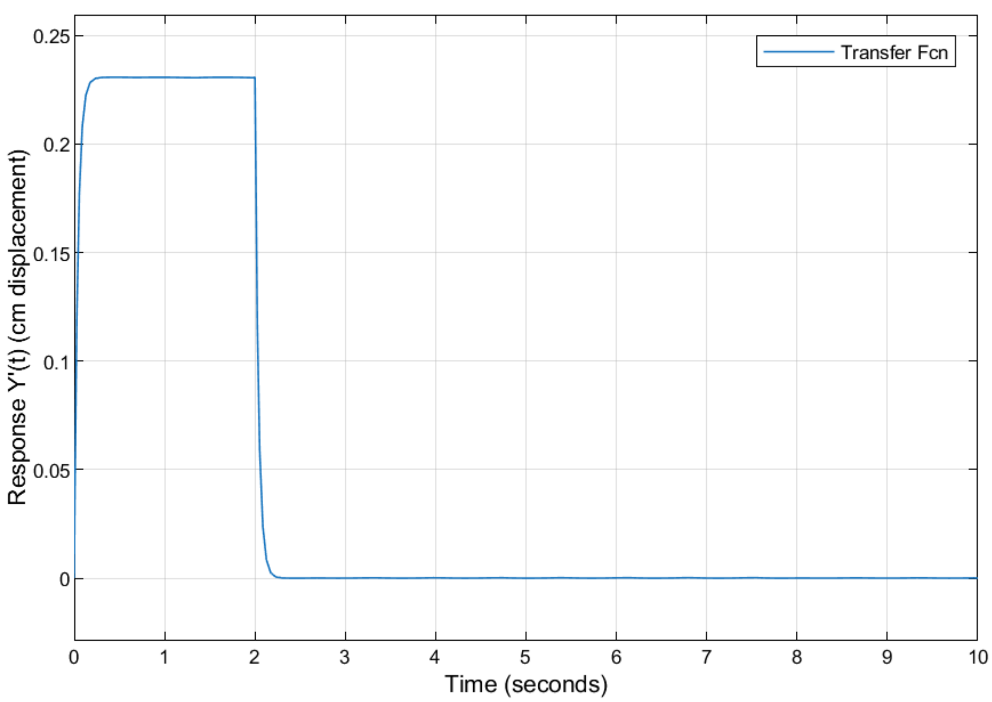

Figure 5: Closed-loop step response

2. Question 2

   (2.1) placeholder