

## ME 430/ME 430H/ECE 451

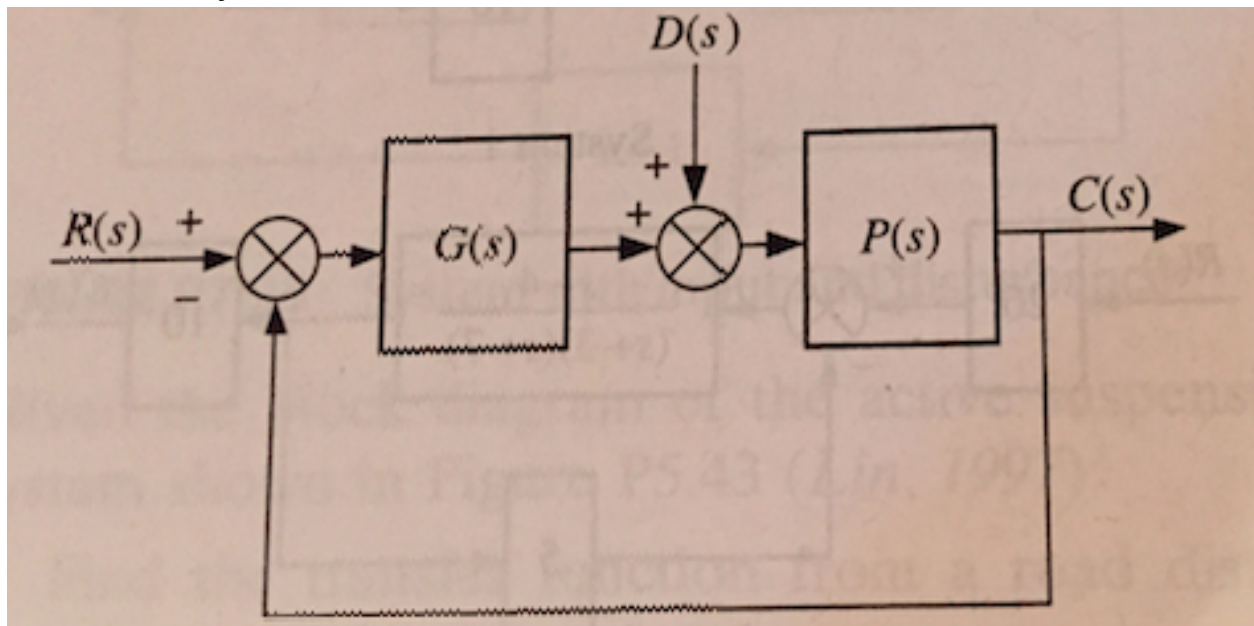
Fall 2016

Due in Class November 16

### Computer Assignment 2

- Include a printout of your code, any related figures, and any handwritten work.
- You do NOT need to email your code to the instructors.

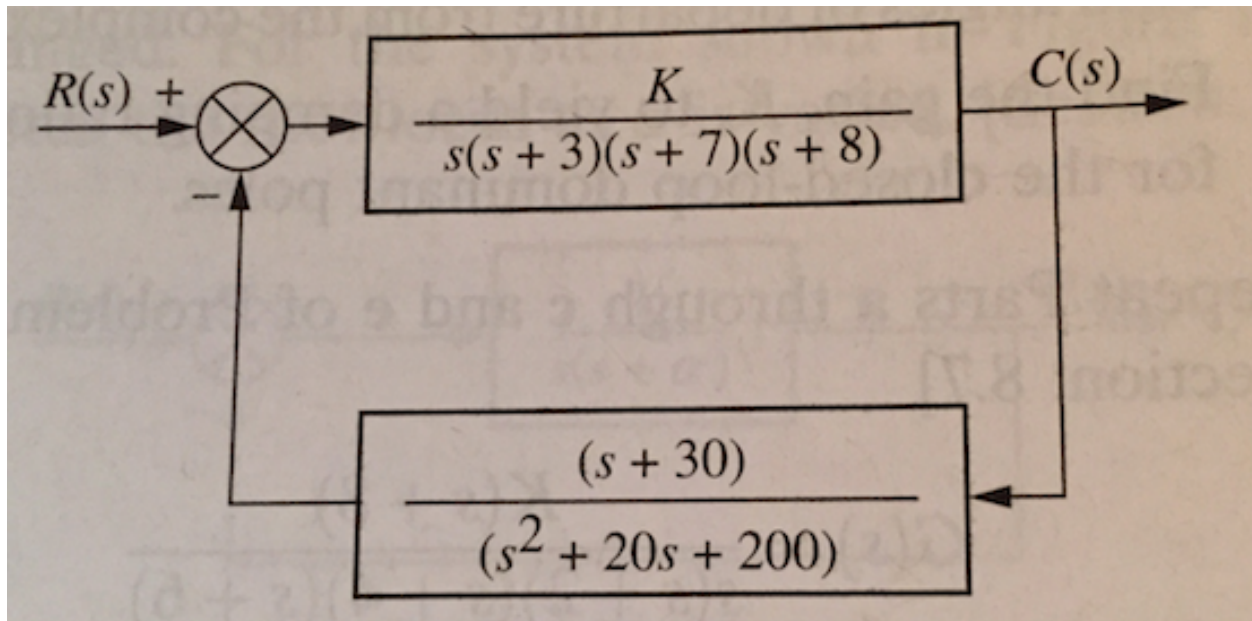
1. Given the system below:



Let  $G(s) = 5$  and  $P(s) = \frac{7}{s+2}$

- Calculate the steady-state error by hand for a command input  $R(s) = \frac{3}{s}$  with  $D(s) = 0$ .
- Verify the result of Part a using Simulink (include a printout of the output).
- Calculate the steady-state error by hand due to a disturbance input  $D(s) = -\frac{1}{s}$  with  $R(s) = 0$ .
- Verify the result of Part c using Simulink (include a printout of the output).
- Calculate the total steady-state error by hand due to a command input  $R(s) = \frac{3}{s}$  and a disturbance  $D(s) = -\frac{1}{s}$  applied simultaneously.
- Verify the result of Part e using Simulink (include a printout of the output).

2. Given the system below:



Write a program in Matlab for the problem above that does the following (provide printouts of your code, root locus plot, damping ratio lines, and step response):

- Display the root locus and pause (use command "rlocus")
- Display a close-up of the root locus where the axes go from -2 to 2 on the real axis and -2 to 2 on the imaginary axis (use the commands "subplot" and "axis")
- Overlay the 0.707 damping ratio line on the close-up root locus. (use command "sgrid")
- Allow yourself to select interactively the point where the root locus crosses the 0.707 damping ratio line and give yourself the gain at that point (use command "rlocfind")
- Generate the step response at the gain for 0.707 damping ratio (use command "step")