HW6

Please use MATLAB to finish the following questions

Submit format : {Student_ID}.m file, no need to submit a report

1.

P8.1 Sketch the polar plot for the following loop transfer functions:

$$\text{(a)}\ L(s) = G_c(s)G(s) = \frac{1}{(1 + 0.25s)(1 + 3s)}$$

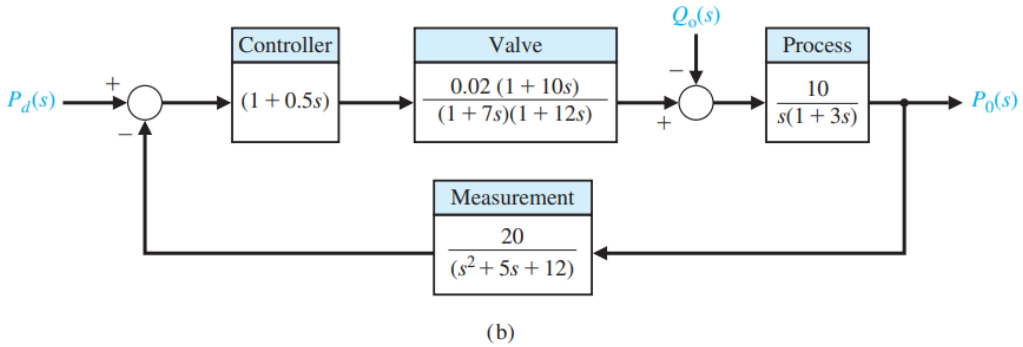
$$\text{(b)}\ L(s) = G_c(s)G(s) = \frac{5(s^2 + 1.4s + 1)}{(s - 1)^2}$$

$$\text{(c)}\ L(s) = G_c(s)G(s) = \frac{s - 8}{s^2 + 6s + 8}$$

$$\text{(d)}\ L(s) = G_c(s)G(s) = \frac{20(s + 8)}{s(s + 2)(s + 4)}$$

2.

P8.4 A control system for controlling the pressure in a closed chamber is shown in Figure P8.4. Sketch the Bode plot of the loop transfer function.



(b)

FIGURE P8.4
(a) Pressure controller. (b) Block diagram model.

3.

P8.9 Sketch the logarithmic-magnitude versus phase angle curve for the transfer functions (a) and (b) of Problem P8.1.

4.

CP9.3 Using the nichols function, obtain the Nichols chart with a grid for the following transfer functions:

(a) $G(s) = \dfrac{1}{s + 0.2}$;

(b) $G(s) = \dfrac{1}{s^2 + 2s + 1}$;

(c) $G(s) = \dfrac{6}{s^3 + 6s^2 + 11s + 6}$.

Determine the approximate phase and gain margins from the Nichols charts and label the charts accordingly.

5.

CP7.9 Consider the feedback control system in Figure CP7.9. Develop an m-file to plot the root locus for $0 < K < \infty$. Find the value of K resulting in a damping ratio of the closed-loop poles equal to $\zeta = 0.707$.

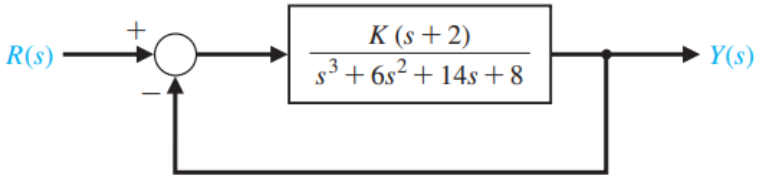


FIGURE CP7.9
Unity feedback system with parameter K.

6.

CP7.4 A unity negative feedback system has the loop transfer function

$$L(s) = G_c(s)G(s) = \frac{p(s-1)}{s^3 + 4s^2 + 5s + 4}.$$

Develop an m-file to obtain the root locus as p varies; $0 < p < \infty$. For what values of p is the closed-loop stable?