



دانشگاه سمنان

Semnan University
Faculty of Mechanical Engineering

دانشکده مهندسی مکانیک



دانشکده مهندسی مکانیک

تمرین درس کنترل

نام و شماره دانشجویی:

CONTROL EXERCISES

HW-5

□ تمرین های زیر از کتاب کنترل مدرن اوگاتا (5th Ed.) :

❖ Modern Control Engineering (5th Edition) by Katsuhiko Ogata

B-6-1 ❖

B-6-2 ❖

B-6-3 ❖

B-6-4 ❖

B-6-5 ❖

B-6-6 ❖

B-6-7 ❖

B-6-8 ❖

❖ تصاویر سوالات در ادامه ارائه شده است.

B-6-1. Plot the root loci for the closed-loop control system with

$$G(s) = \frac{K(s + 1)}{s^2}, \quad H(s) = 1$$

B-6-2. Plot the root loci for the closed-loop control system with

$$G(s) = \frac{K}{s(s + 1)(s^2 + 4s + 5)}, \quad H(s) = 1$$

B-6-3. Plot the root loci for the system with

$$G(s) = \frac{K}{s(s + 0.5)(s^2 + 0.6s + 10)}, \quad H(s) = 1$$

B-6-4. Show that the root loci for a control system with

$$G(s) = \frac{K(s^2 + 6s + 10)}{s^2 + 2s + 10}, \quad H(s) = 1$$

are arcs of the circle centered at the origin with radius equal to $\sqrt{10}$.

B-6-5. Plot the root loci for a closed-loop control system with

$$G(s) = \frac{K(s + 0.2)}{s^2(s + 3.6)}, \quad H(s) = 1$$

B-6-6. Plot the root loci for a closed-loop control system with

$$G(s) = \frac{K(s + 9)}{s(s^2 + 4s + 11)}, \quad H(s) = 1$$

Locate the closed-loop poles on the root loci such that the dominant closed-loop poles have a damping ratio equal to 0.5. Determine the corresponding value of gain K .

B-6-7. Plot the root loci for the system shown in Figure 6-100. Determine the range of gain K for stability.

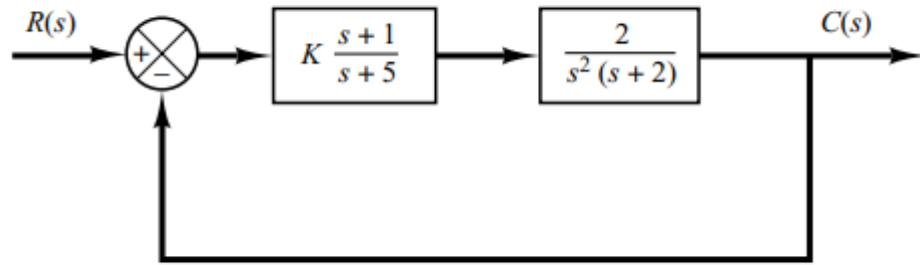


Figure 6-100
Control system.

B-6-8. Consider a unity-feedback control system with the following feedforward transfer function:

$$G(s) = \frac{K}{s(s^2 + 4s + 8)}$$

Plot the root loci for the system. If the value of gain K is set equal to 2, where are the closed-loop poles located?