دانشکده مهندسی مکانیک

تمرین درس کنترل

نام و شماره دانشجویی:

CONTROL EXERCISES

HW-6

- تمرین های زیر از کتاب کنترل مدرن اوگاتا (5th Ed.) :
  - Modern Control Engineering (5th Edition) by Katsuhiko Ogata
    - B-7-1
    - B-7-2
    - B-7-3
    - B-7-4
    - B-7-8
    - B-7-12
    - B-7-24
    - B-7-30
    - تصاویر سوالات در ادامه ارائه شده است.

B–7–1. Consider the unity-feedback system with the open-loop transfer function:

$$G(s) = \frac{10}{s + 1}$$

Obtain the steady-state output of the system when it is subjected to each of the following inputs:

(a) $r(t) = \sin(t + 30°)$

(b) $r(t) = 2\cos(2t - 45°)$

(c) $r(t) = \sin(t + 30°) - 2\cos(2t - 45°)$

B–7–2. Consider the system whose closed-loop transfer function is

$$\frac{C(s)}{R(s)} = \frac{K(T_2 s + 1)}{T_1 s + 1}$$

Obtain the steady-state output of the system when it is subjected to the input $r(t) = R \sin \omega t$.

B–7–3. Using MATLAB, plot Bode diagrams of $G_1(s)$ and $G_2(s)$ given below.

$$G_1(s) = \frac{1 + s}{1 + 2s}$$

$$G_2(s) = \frac{1 - s}{1 + 2s}$$

$G_1(s)$ is a minimum-phase system and $G_2(s)$ is a nonminimum-phase system.

B–7–4. Plot the Bode diagram of

$$G(s) = \frac{10(s^2 + 0.4s + 1)}{s(s^2 + 0.8s + 9)}$$

B–7–8. Draw a Nyquist locus for the unity-feedback control system with the open-loop transfer function

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

Using the Nyquist stability criterion, determine the stability of the closed-loop system.

B–7–12. Draw a Nyquist plot of the following $G(s)$:

$$G(s) = \frac{1}{s(s^2 + 0.8s + 1)}$$

B–7–24. Consider the system shown in Figure 7–161. Draw a Bode diagram of the open-loop transfer function $G(s)$. Determine the phase margin and gain margin.

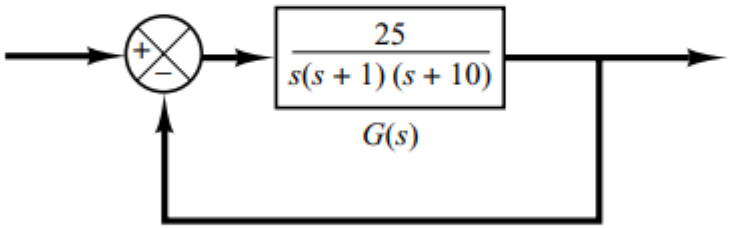

Figure 7–161
Control system.

B–7–30. Draw Bode diagrams of the PI controller given by

$$G_c(s) = 5\left(1 + \frac{1}{2s}\right)$$

and the PD controller given by

$$G_c(s) = 5(1 + 0.5s)$$