بسمه تعالی

تکلیف شماره 6- درس سیستمهای کنترل خطی ..... مدرس: دکتر دوایی

مبحث: تحلیل حوزه زمان (قسمت سوم)

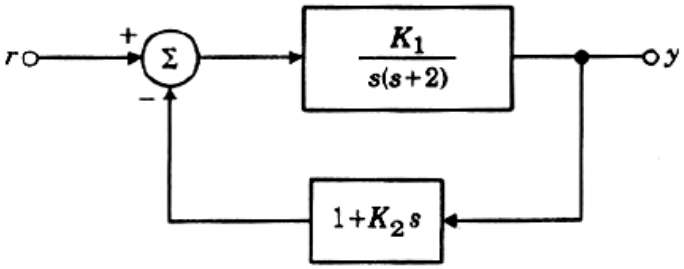
تاریخ تحویل: یک هفته پس از تحویل

1.

The feedback control system shown in Fig. 3.33 is to be designed to satisfy the following specifications: (1) steady-state error to a ramp input less than 10% of the input magnitude,(2) maximum percent overshoot for a unit step input less than 5%, and (3) settling time (1%) less than 3 s.

a) Compute the closed-loop transfer function.
b) Find the error due to a unit ramp input.
c) What does (1) imply about the possible values of K_1?
d) What does (3) imply about the closed-loop poles?
e) Sketch the region in the complex plane where the closed-loop poles may lie.
f) Suppose $K_1 = 32$. Find the values of K_2 such that the poles are on the right-hand boundary of the feasible region.
g) Estimate the settling time of the system.

FIGURE 3.33



2.

A position-control system has the overall transfer function (meter/meter) given by

$$\frac{y}{r} = \frac{b_0 s + b_1}{s^2 + a_1 s + a_2}.$$

Suppose we are able to select all the parameters. Choose them so that

a) Rise time is $t_r \leq 0.1$ s.
b) Percent overshoot $M_p \leq 20$.
c) Setting time $t_s \leq 0.5$ s.
d) Steady-state error to a constant command is zero.
e) Steady-state to a ramp of 0.1 m/s is not more than 1 mm.

موفق باشید