Portland State University

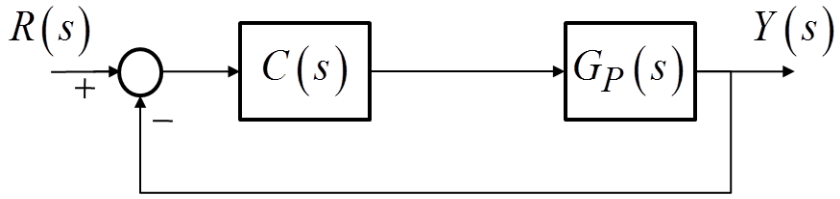
Electrical & Computer Engineering

ECE 311 Feedback & Control

-Homework #8-

Problem 1:

Given the system below:



$$G_P(s) = \frac{20}{(s+1)(s+6)}$$

Following the procedures discussed in lecture, design a compensator to meet the following specification:

- Error coefficient $K_i = \infty$
- Settling time close to original system (within 0.5 seconds). Note, this may require additional tuning beyond rules of thumb!

State the new phase margin, cross-over frequency, error coefficient, verify the specs are met
State the values of appropriate design coefficients (*K, a, b, d,* etc.)

Problem 2:

Following the procedures discussed in lecture, design a compensator to meet the following specification:

- Increase the error coefficient by a factor of 6.
- Settling time close to original system (within 0.5 seconds). Note, this may require additional tuning beyond rules of thumb!

State the new phase margin, cross-over frequency, error coefficient, verify the specs are met
State the values of appropriate design coefficients (*K, a, b, d,* etc.)

Problem 3:

Following the procedures discussed in lecture, design a compensator to meet the following specification:

- Increase the cross-over frequency by at least a factor of 3

- Settling time faster than original system (around twice as fast). Note, this may require additional tuning beyond rules of thumb!

State the new phase margin, cross-over frequency, error coefficient, verify the specs are met
State the values of appropriate design coefficients (*K, a, b, d,* etc.)

Fundamentals of Engineering Exam Problem 1:

For the open-loop function F(s)

$$F(s) = \frac{K}{s(s+3)(s+5)}$$

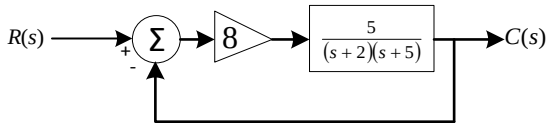
the location of the poles of *f(s)* are most nearly:

(A) -3, -5 rad/s
(B) 3, 5 rad/s
(C) 0, -3, -5 rad/s
(D) 0, 3, 5 rad/s

Fundamentals of Engineering Exam Problem 2:

For the system shown below, the error coefficient, ε, is

$$\varepsilon = \lim_{s \to 0} \frac{1}{1 + G(s)}$$



The error coefficient is most nearly:

(A) 1/5
(B) 1/30
(C) 2/3
(D) 1/4