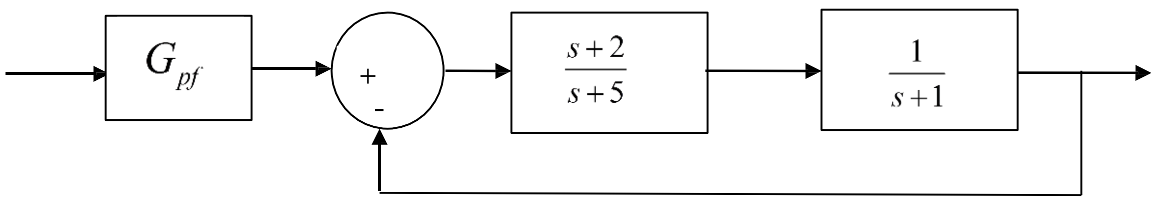
Name ______________________________ Mailbox ____________

ECE-320, Quiz #3

Problems 1-3 refer to the following system:



1) Assuming the prefilter G_{pf} is 1, the **position error constant** K_p is best approximated as

a) 2/3 b) 2/5 c) 1 d) 0

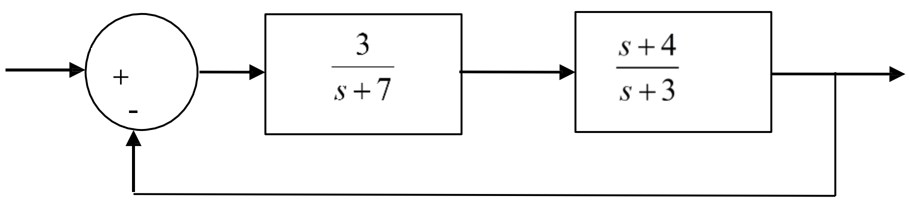
2) Assuming the prefilter G_{pf} is 1, the **steady state error** for a unit step is best approximated as

a) 1/3 b) 5/7 c) 3/5 d) 2/5

3) The value of the prefilter G_{pf} that produces **a steady state error** of zero is:

a) 1 b) 7/2 c) 5/2 d) 7/5

4) For the following system

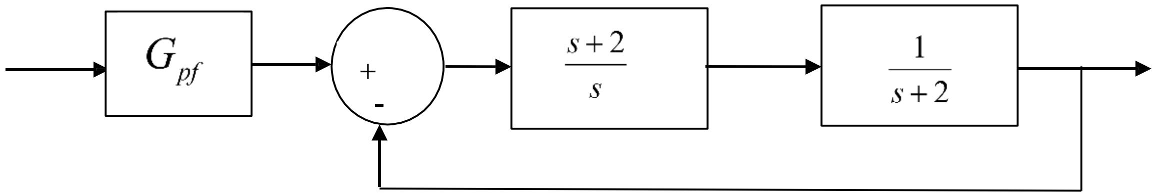


The dynamic prefilter which cancels the closed loop zeros and produces a zero steady state error for a unit step input is

a) $\frac{\frac{11}{8}}{s+4}$ b) $\frac{\frac{11}{2}}{s+4}$ c) $\frac{11}{s+4}$ d) $\frac{\frac{3}{2}}{s+4}$

Name ________________________________ Mailbox ______________

Problems 5-7refer to the following system



5) Assuming the prefilter G_{pf} is 1, the **velocity error constant** K_v is best approximated as

a) 2/3 b) 2/5 c) 1 d) 0

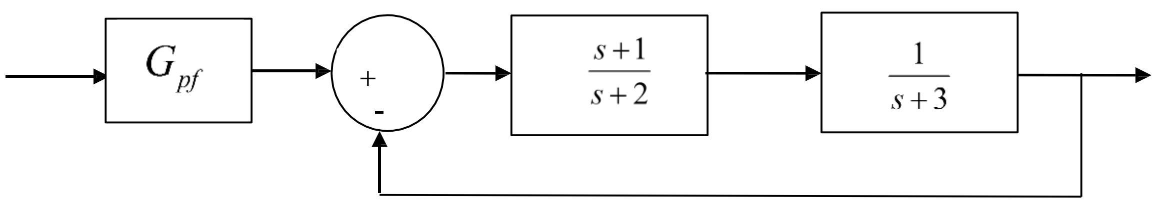
6) Assuming the prefilter G_{pf} is 1, the **steady state error** for a unit ramp input is best approximated as

a) 1/2 b) 1 c) 2 d) 1/2

7) Assuming the prefilter G_{pf} is 1, the **steady state error** for a unit step input is best approximated as

a) ∞ b) 0 c) 1 d) 2/5

8) Consider the closed loop system below:



If we want to use a dynamic prefilter to **cancel the closed loop zero** and produce a **zero steady state error for a unit step**, we should choose the prefilter as

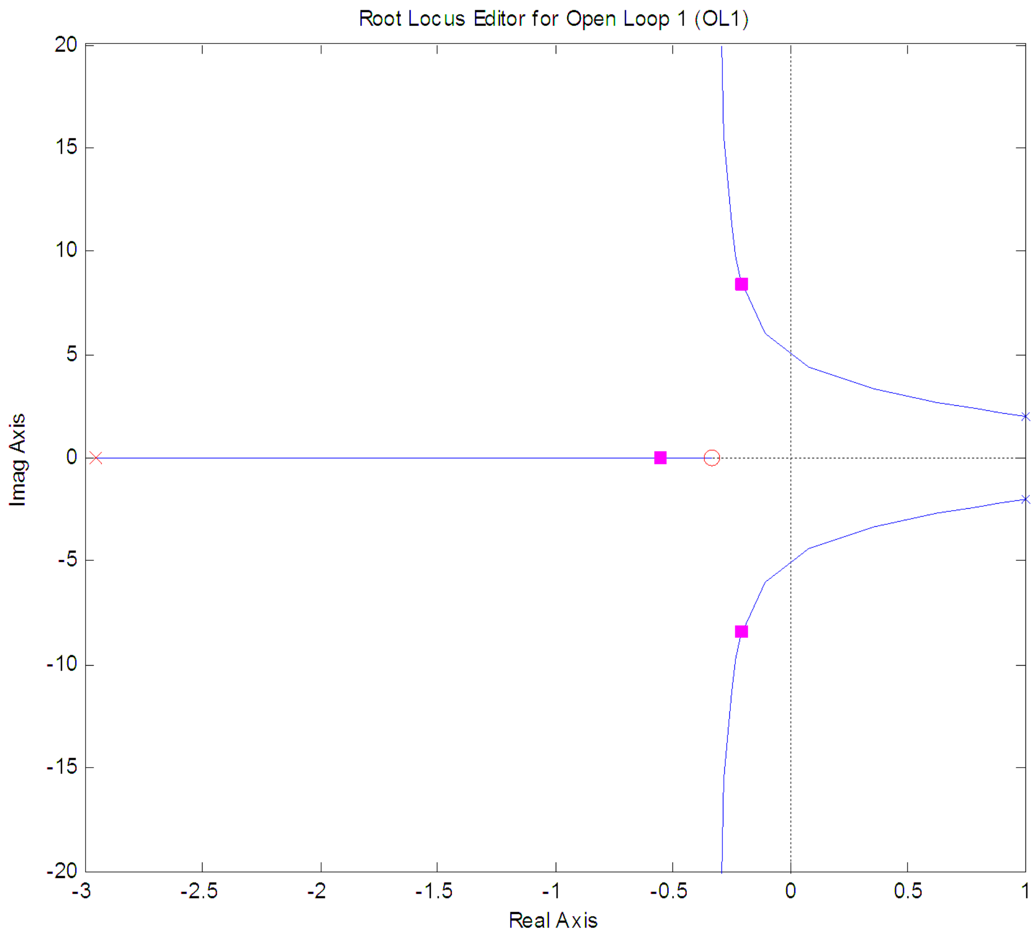
a) $G_{pf}(s) = \frac{1}{s+1}$ b) b) $G_{pf}(s) = \frac{5}{s+1}$ c) $G_{pf}(s) = \frac{6}{s+1}$ d) $G_{pf}(s) = \frac{7}{s+1}$

Name ________________________________ Mailbox ______________

9) Is $G_{pf}(s) = \dfrac{1}{(s-1)(s+2)}$ an acceptable prefilter (for any system)?

a) Yes b) No

Problems 10-12 refer to the following root locus plot for a unity feedback system with a plant and a controller.



10) Based on this root locus plot, the best estimate of the poles of the closed loop system are

a) -0.3+j7, -0.3-j7, -0.6 b) 1+j2, 1-j2, and -3

11) Is this a type one system? a) yes b) no

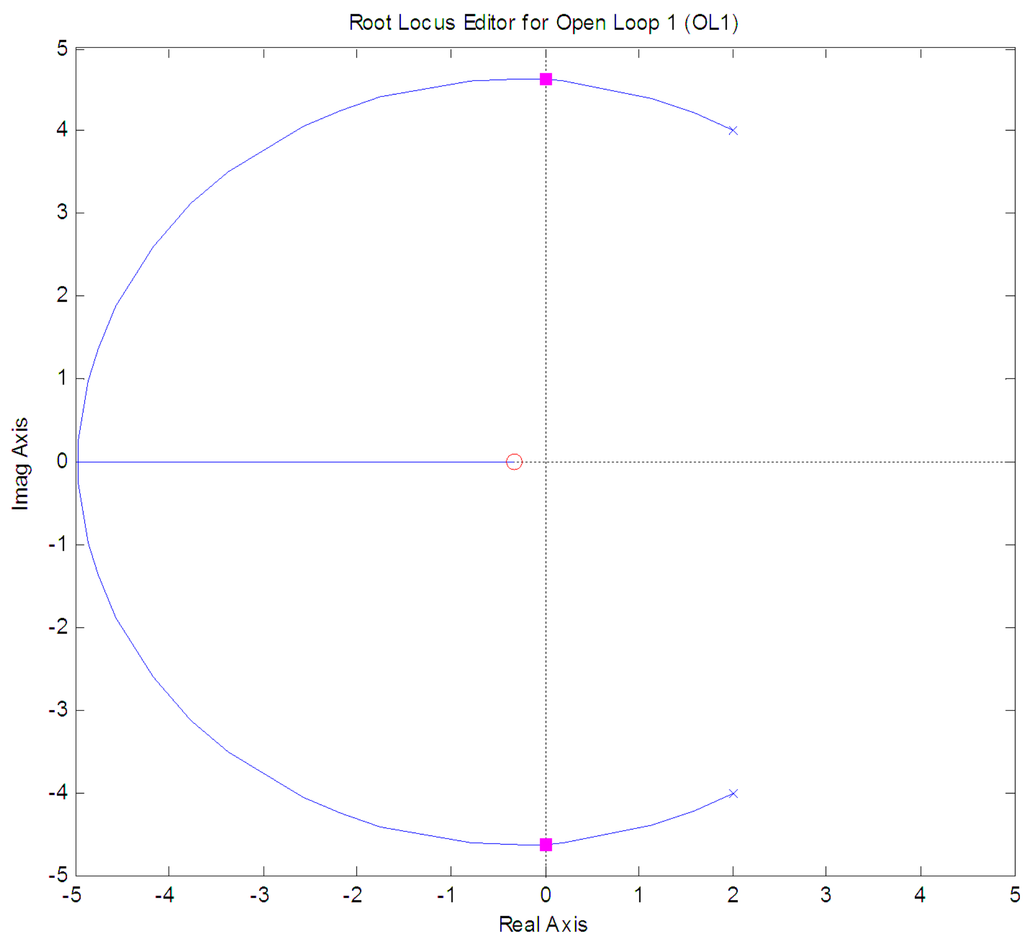
12) Is this a stable system? a) yes b) no

Name ________________________________ Mailbox ______________

13) Consider the following root locus plot for a plant and controller in a unity feedback configuration.

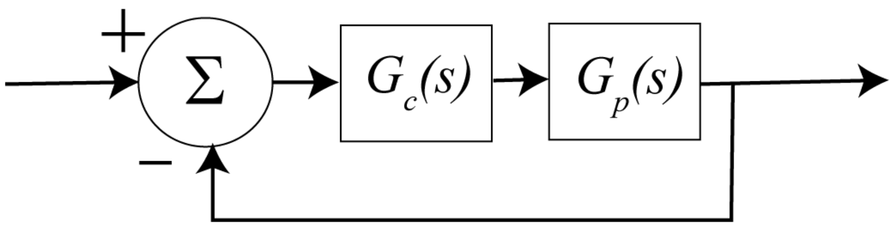
If we want the system to be stable, should we

a) increase the gain b) decrease the gain c) do nothing



Name ______________________________ Mailbox _____________

Problems 14-19 refer to the following feedback system with plant $G_p(s) = \frac{1}{(s+3)(s+4)}$



14) If we use a proportional controller $G_c(s) = k_p$ will the system remain stable for all positive values of k_p?

a) yes b) no

15) If we use a proportional controller $G_c(s) = k_p$ is there any value of k_p for which the settling time is less than 0.5 seconds?

a) yes b) no

16) If we use an integral controller $G_c(s) = \frac{k_i}{s}$ will the system remain stable for all positive values of k_i?

a) yes b) no

17) If we use an integral controller $G_c(s) = \frac{k_i}{s}$ is there any value of k_i for which the settling time is less than 0.5 seconds?

a) yes b) no

18) For which of the following PID controllers will the settling time be smaller as $k \to \infty$

a) $G_c(s) = \frac{k(s+2+j)(s+2-j)}{s}$ b) $G_c(s) = \frac{k(s+4+2j)(s+4-2j)}{s}$

c) the results will be the same

19) For which of the following PD controllers will the settling time be smaller as $k \to \infty$

a) $G_c(s) = k(s+5)$ b) $G_c(s) = k(s+10)$ c) the results will be the same

Name ________________________________ Mailbox ______________

(Problems 20-22) The standard form for a PID controller is

$$G_c(s) = k_p + \frac{k_i}{s} + k_d s$$

For the following PID controller $G_c(s) = \frac{5(s^2 + 2s + 1)}{s}$ determine k_p, k_i, and k_d