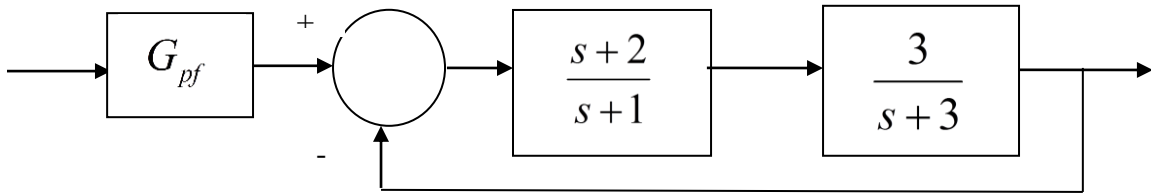


**Quiz #9**

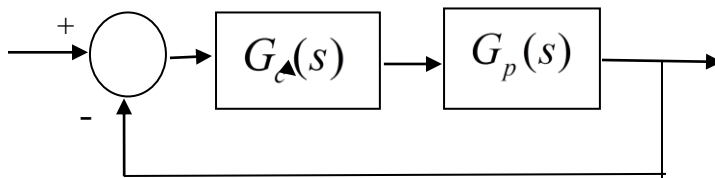
1) For the following system:



the value of the prefilter  $G_{pf}$  that produces **a steady state error** of zero for a unit step input is:

- a) 1    b) 3/2    c) 5/2    d) 1/3

2) For the following system



the pole of the controller  $G_c(s)$  is at -15

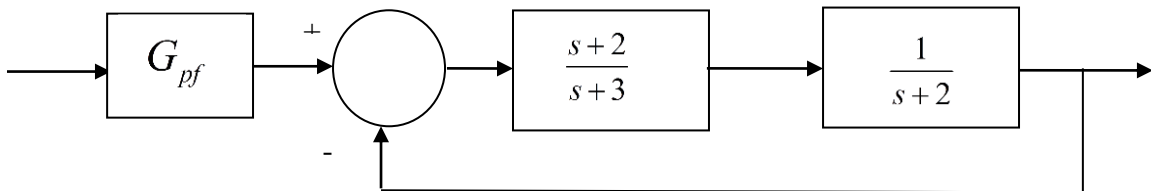
the poles of the plant  $G_p(s)$  are at -1 and -2

the poles of the closed loop system are at -7.1, -5.43 +3.98j, -5.43 -3.98j

The best estimate of the settling time of the closed loop system is

- a) 4 seconds    b)  $\frac{4}{15}$  seconds    c)  $\frac{4}{7.1}$  seconds    d)  $\frac{4}{5.43}$  seconds

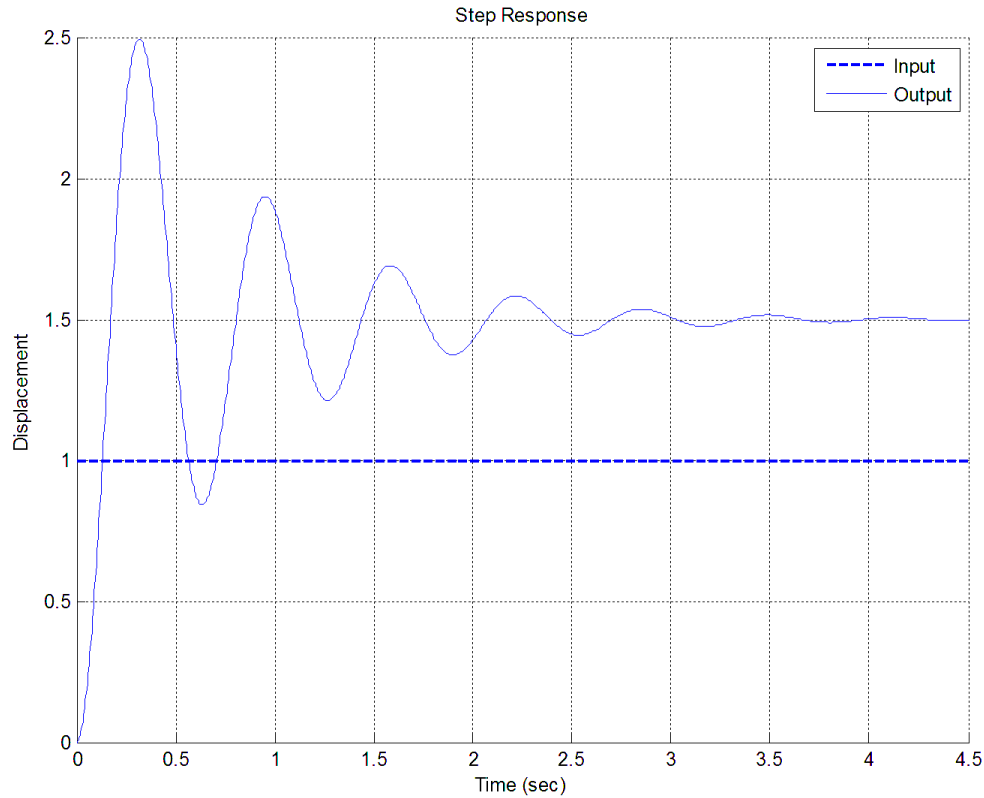
3) For the following system:



the value of the prefilter  $G_{pf}$  that produces **a steady state error** of zero for a unit step input is:

- a) 1    b) 3/2    c) 4    d) 1/3

Problems 4 and 5 refer to the **unit step response** of a system, shown below



4) The best estimate of the **steady state error** for a **unit step input** is

- a) 0.5   b) -0.5   c) 1.5   d) -1.5   e) none of these

5) The best estimate of the **percent overshoot** is

- a) 200%   b) 100%   c) 67%   d) 50%   e) none of these

6) The **unit step response** of a system is given by  $y(t) = -u(t) - t^4 e^{-t} u(t) + e^{-2t} u(t)$

The **steady state error** for a unit step input for this system is best estimated as

- a)  $\infty$    b) 0.5   c) 2.0   d) impossible to determine

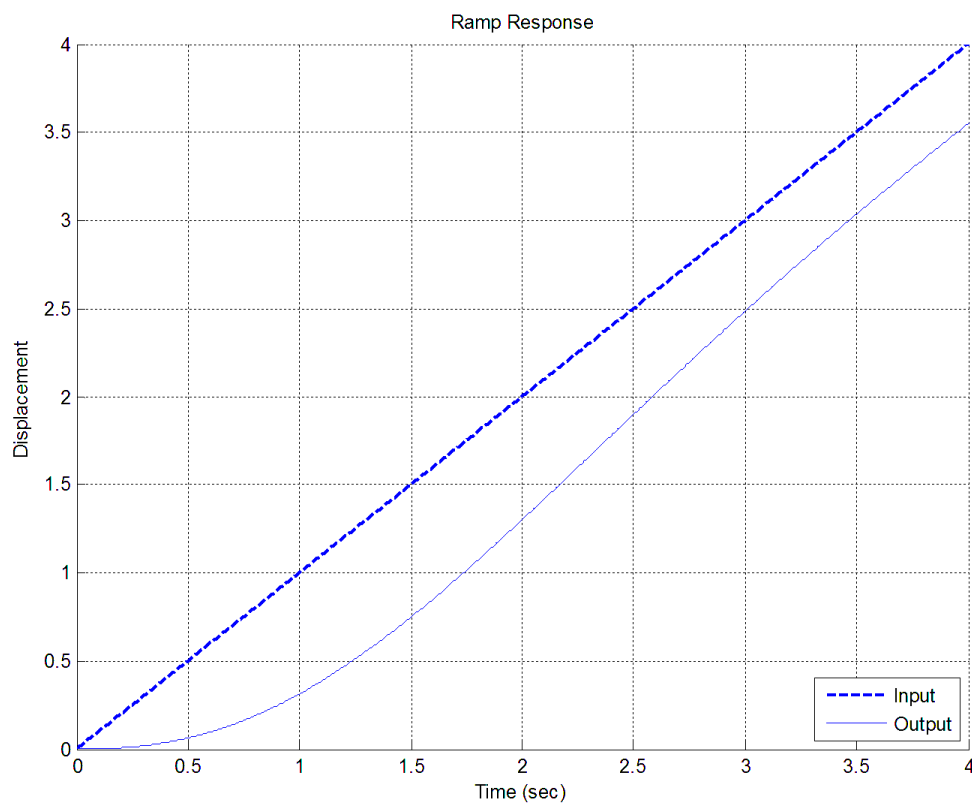
7) The **unit ramp response** of a system is given by  $y(t) = -2u(t) + tu(t) + e^{-t}u(t)$  .

The best estimate of the **steady state error** is

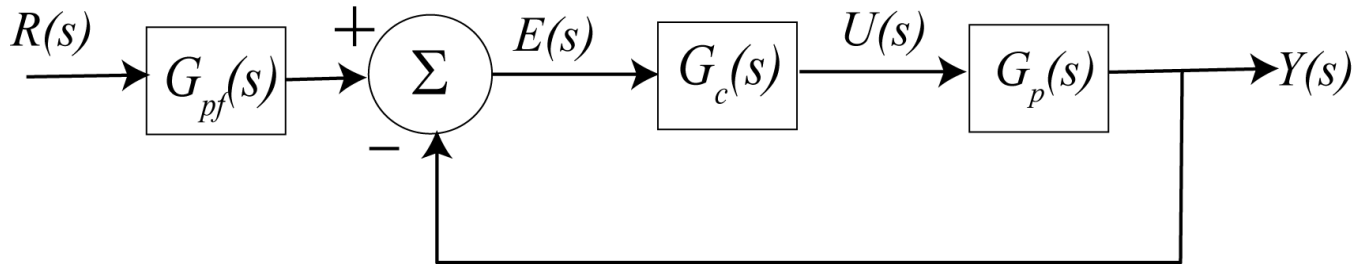
- a) 0.5   b) 2.0   c) 1.0   d)  $\infty$

8) For a system with unit ramp response shown below, the best estimate of the **steady state error** is

- a) 0.5   b) -0.5   c) 0.8   d) -0.8   e) 0.0   f) none of these



Problems 9-12 refer to the following feedback system, with the plant  $G_p(s) = \frac{4}{s+1}$  and proportional controller,  $G_c(s) = k_p$



9) What is the (2%) settling time of the plant ?

- a) 1 second   b) 2 seconds   c) 3 seconds   d) 4 seconds   e) none of these

10) If we want the settling time to be 4/21 seconds, the value of  $k_p$  should be

- a) 5   b) 10   c) 21   d) 25   e) none of these

11) If we assume the prefilter is 1 ( $G_{pf}(s) = 1$ ), and we want the steady state error for a unit step to be 1/25, then we should choose the value of  $k_p$  to be

- a) 3   b) 4   c) 5   d) 6   e) none of these

12) Does a constant prefilter affect the settling time? a) yes   b) no

Problems 13 -15 refer to a plant with transfer function  $G_p(s) = \frac{5}{(s+1)(s+4)}$

13) The (2%) settling time for this plant is

- a) 1 seconds   b) 2 seconds   c) 3 seconds   d) 4 seconds   e) none of these

14) If the input to the plant is a unit step, the steady state error will be

- a) 0   b) 0.25   c) -0.25   d) 3/8   e) 1.0   f) none of these

15) The static gain of the plant is a) 1   b) 1.25   c) 5   d) none of these