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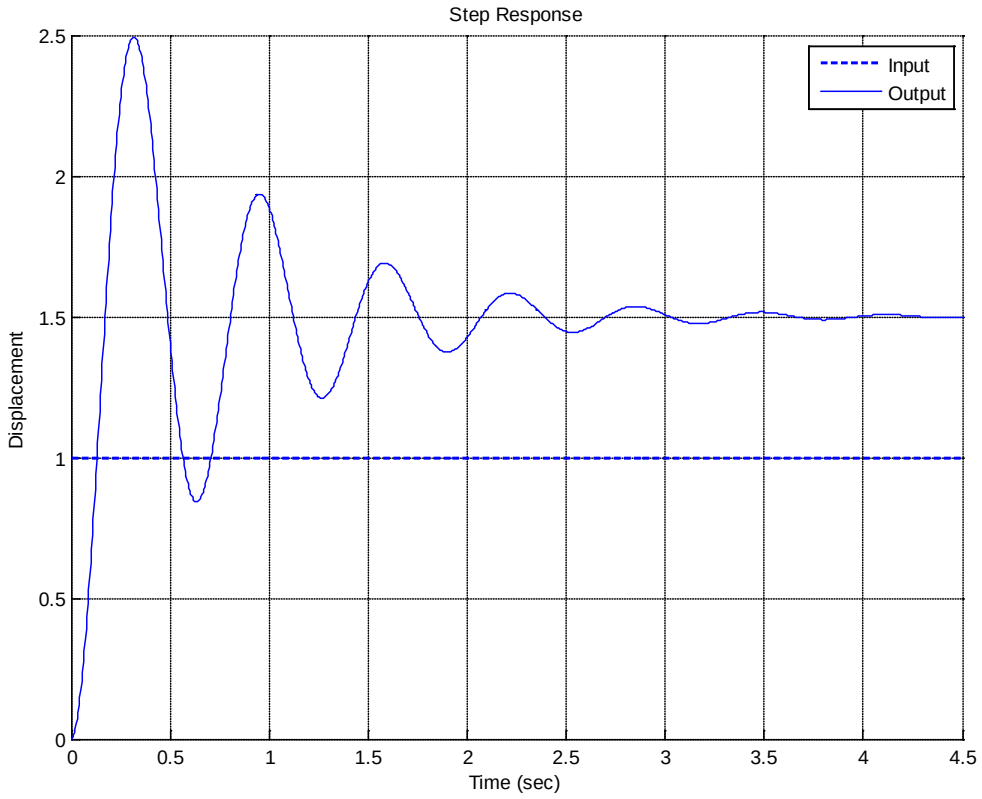
ECE-320, Quiz #2

Problems 1-3 refer to the **unit step response** of a system, shown below



1) 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

2) The best estimate of the **steady state error** for a **unit ramp input** is

a) 0.0 b) 0.25 c) ∞ d) impossible to determine

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

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

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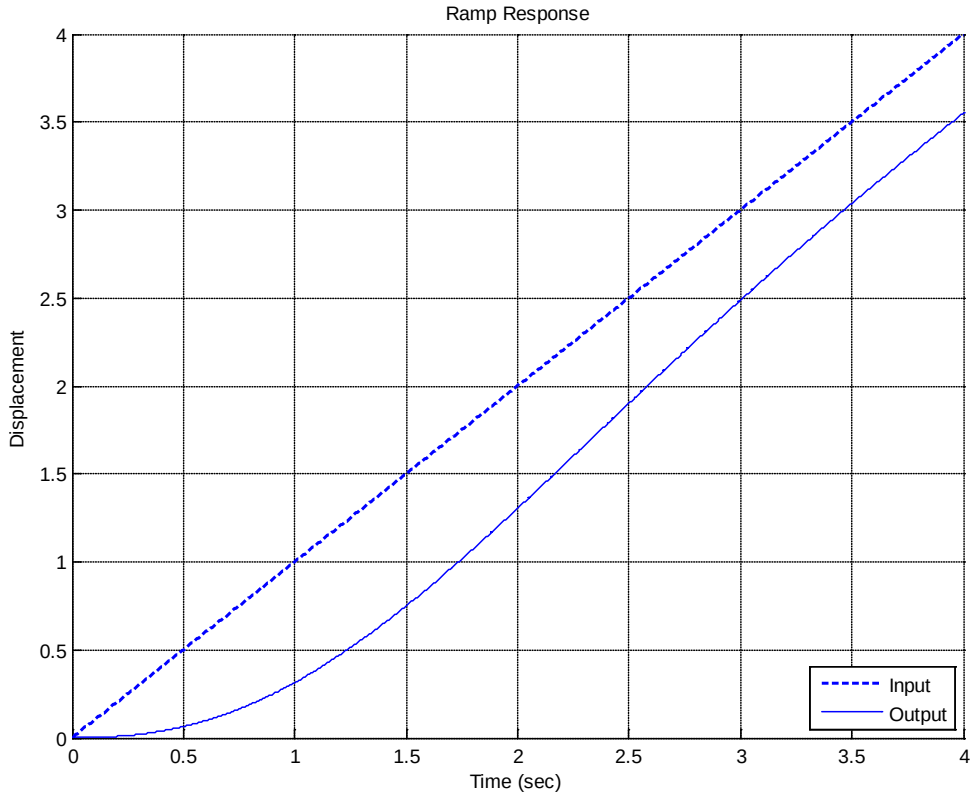
Problems 4 and 5 refer to the **unit ramp response** of a system, shown below:



4) 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

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

a) 1.0 b) 0.5 c) 0.0 d) ∞

Problems 6 and 7 refer to the impulse responses of six different systems given below:

$$h_1(t) = [t + e^{-t}]u(t)$$
$$h_2(t) = e^{-2t}u(t)$$
$$h_3(t) = [2 + \sin(t)]u(t)$$
$$h_4(t) = [1 - t^3 e^{-0.1t}]u(t)$$
$$h_5(t) = [1 + t + e^{-t}]u(t)$$
$$h_6(t) = [te^{-t}\cos(5t) + e^{-2t}\sin(3t)]u(t)$$

6) The number of **stable systems** is a) 0 b) 1 c) 2 d) 3

7) The number of **unstable systems** is a) 0 b) 1 c) 2 d) 3

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8) 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

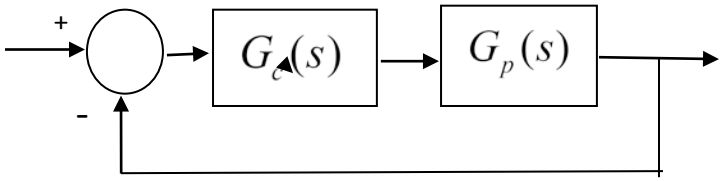
a) ∞ b) 0.5 c) 2.0 d) impossible to determine

9) 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) ∞

10) For the following system

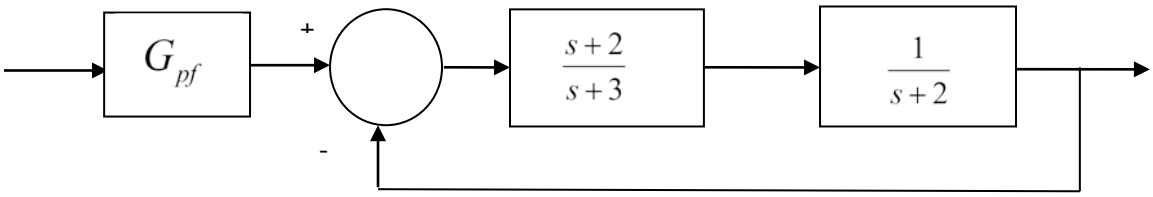


the pole of the controller $G_c(s)$ is at -15
the poles of the plant $G_p(s)$ are at -1 and -2
the poles of the closed loop system are at -7.1, -5.43 +3.98j, -5.43 -3.98j

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

11) 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

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12) Which of the following transfer functions represents a **stable** system?

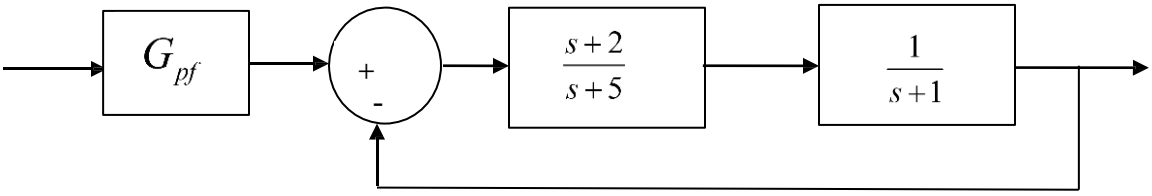
$$G_a(s)=\frac{s-1}{s+1} \qquad G_b(s)=\frac{1}{(s+1)^2} \qquad G_c(s)=\frac{s}{s^2-1}$$

$$G_d(s)=\frac{s+1}{(s+1+j)(s+1-j)} \qquad G_e(s)=\frac{(s-1-j)(s-1+j)}{s} \qquad G_f(s)=\frac{(s-1-j)(s-1+j)}{(s-1-j)(s-1+j)}$$

a) all but G_c b) only G_a, G_b, and G_d c) only G_a, G_d, and G_f

d) only G_d and G_f e) only G_a and G_d

Problems 13-15 refer to the following system:



13) 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

14) 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

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

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

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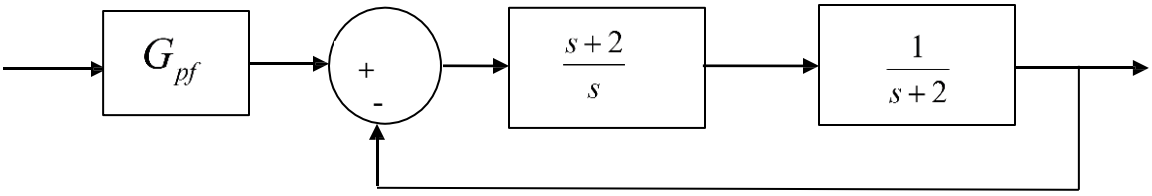
Problems 16-18refer to the following system



16) 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

17) 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

18) 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