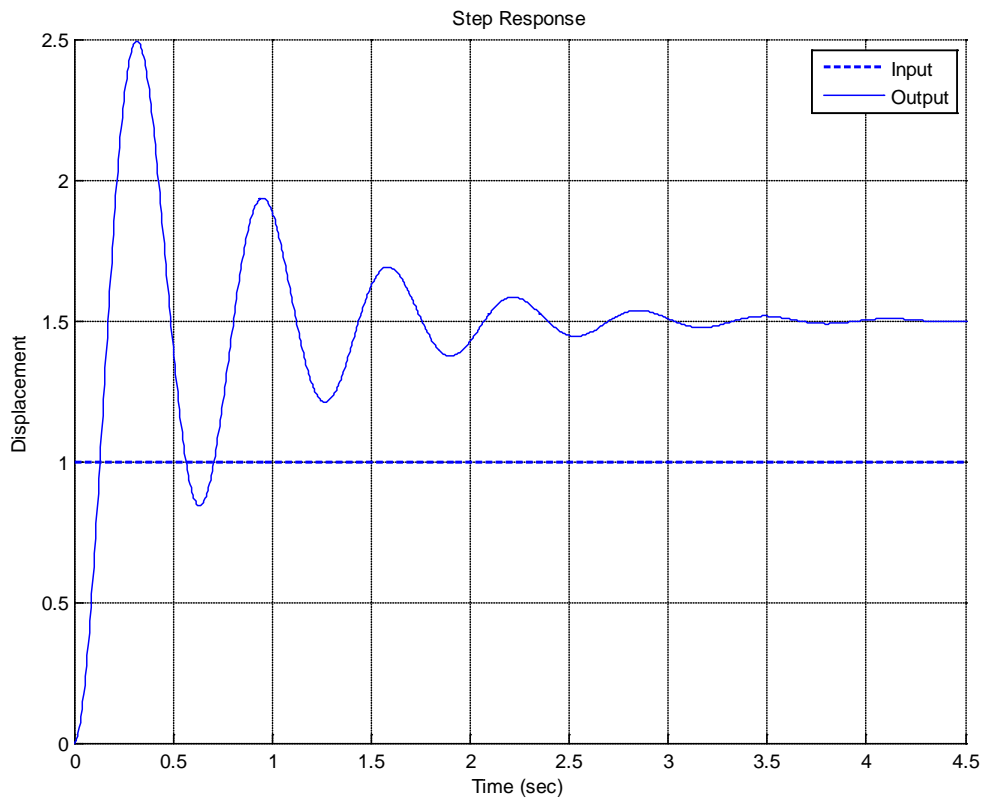


ECE-320, Quiz #2

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

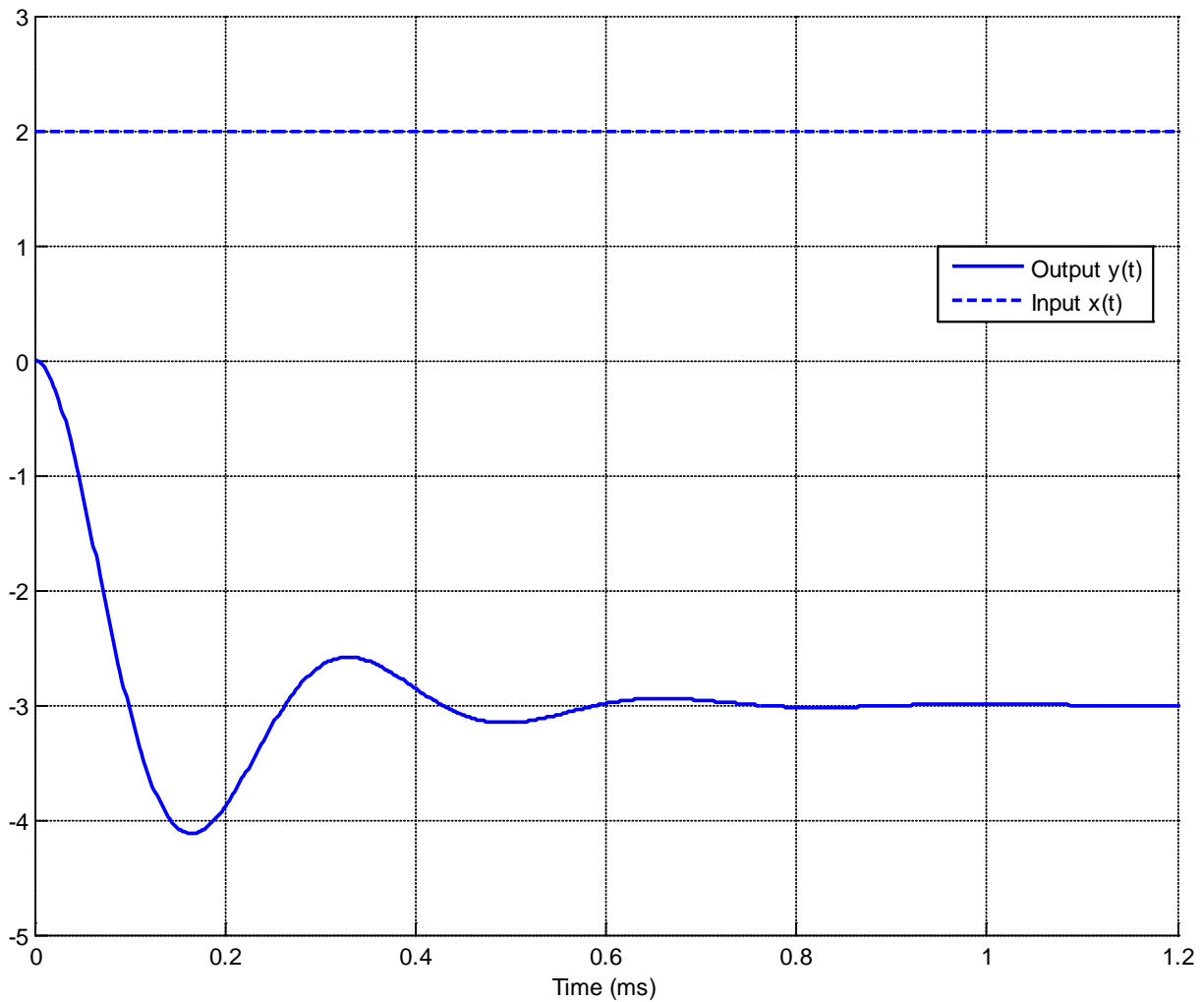
2) The best estimate of the steady state error for a **unit ramp input** is

- 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

Problems 4 and 5 refer the following graph showing the response of a second order system to a step input.



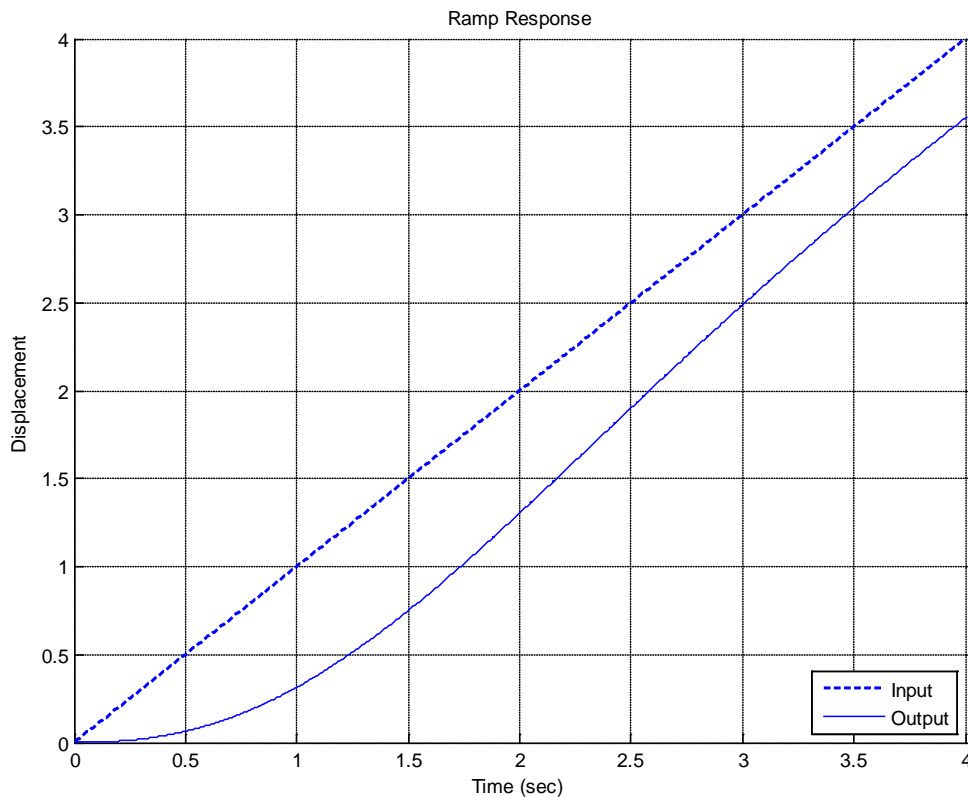
4) The percent overshoot for this system is best estimated as

- a) 400% b) -400 % c) 300% d) -300 % e) -33% f) 33%

5) The steady state error for this system is best estimated as

- a) 5 b) -5 c) -3 d) -4

Problems 6 and 7 refer to the **unit ramp response** of a system, shown below:



6) 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

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

- a) 1.0 b) 0.5 c) 0.0 d) ∞

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

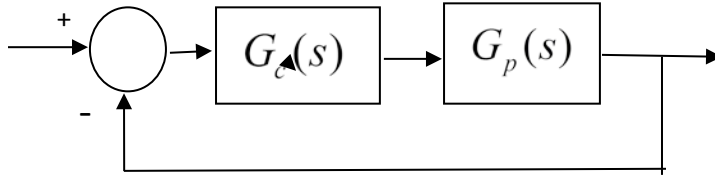
The **steady state error** for a unit step input for this system is best estimated as

- 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

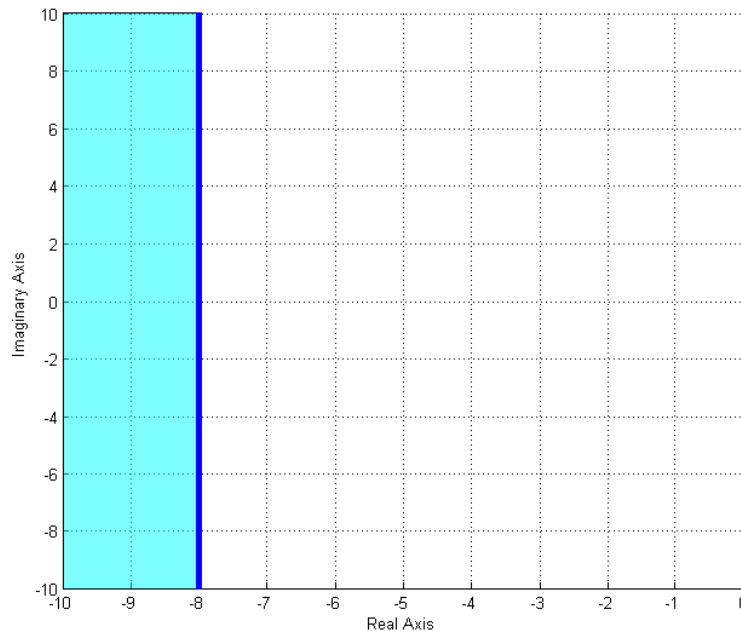
the poles of the closed loop system are at -7.1, $-5.43 + 3.98j$, $-5.43 - 3.98j$

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

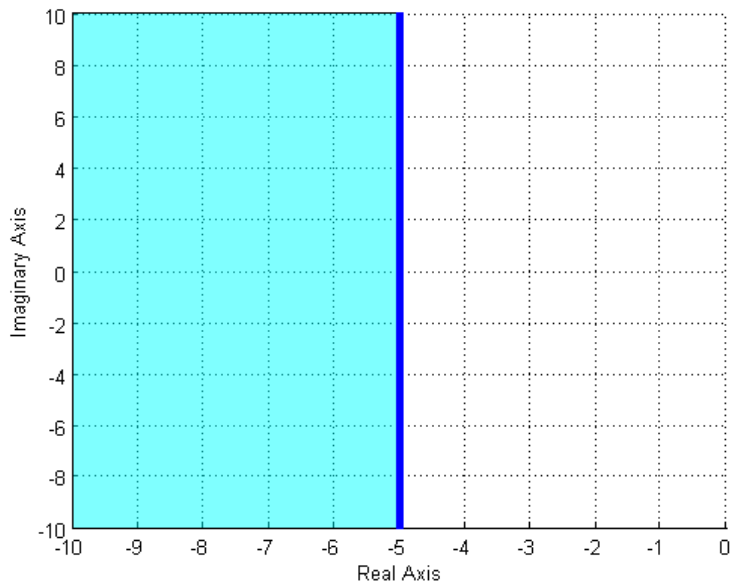
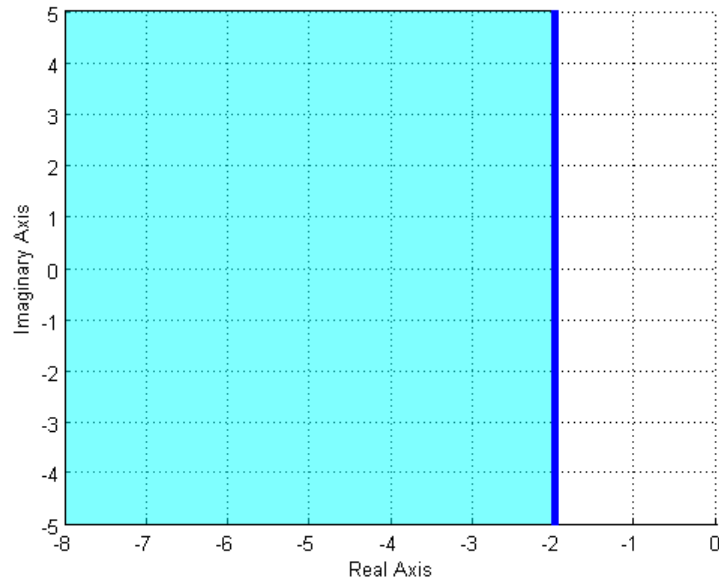
11) The (dark) shaded area in the s-plane figure below shows the possible pole location for an ideal second order system that meets which of the following constraints?

- a) $T_s \leq 0.5$ b) $T_s \geq 0.5$ c) $T_s \geq 8$ d) $T_s \leq 8$ e) none of these



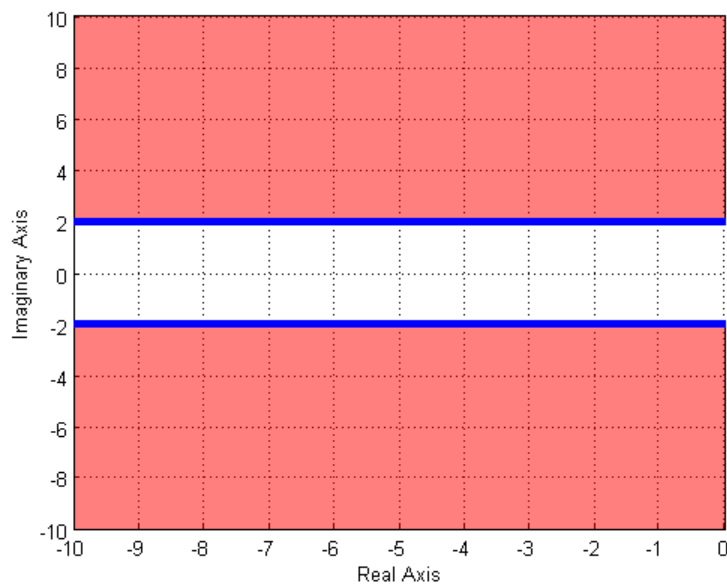
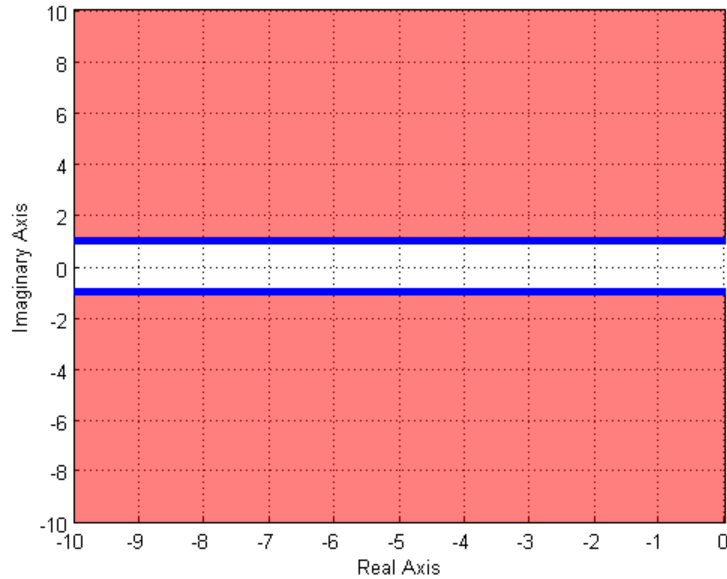
12) Assuming we are allowed to place our poles only in the (dark) shaded areas, which of the following two shaded regions will in general result in a **smaller settling time** for our system?

- a) the region in the top figure b) the region in the bottom figure



13) Assuming we are allowed to place our poles only in the (dark) shaded areas, which of the following two shaded regions will in general result in a **smaller time to peak** for our system?

- a) the region in the top figure b) the region in the bottom figure



14) One of the shaded regions below shows the possible pole locations for a percent overshoot less than 10%, and the other shows the possible pole locations for a percent overshoot less than 20%. Which of the two graphs shows the possible pole locations for a percent overshoot less than 20%?

- a) the region in the top figure b) the region in the bottom figure

