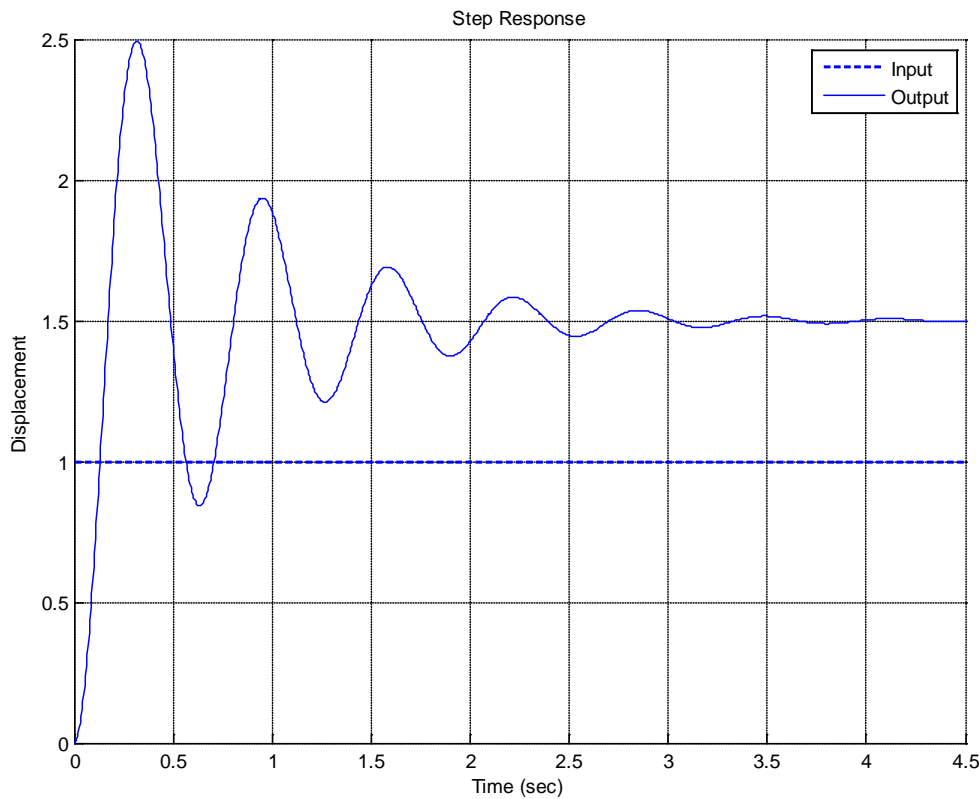


**ECE-320, Quiz #2**

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

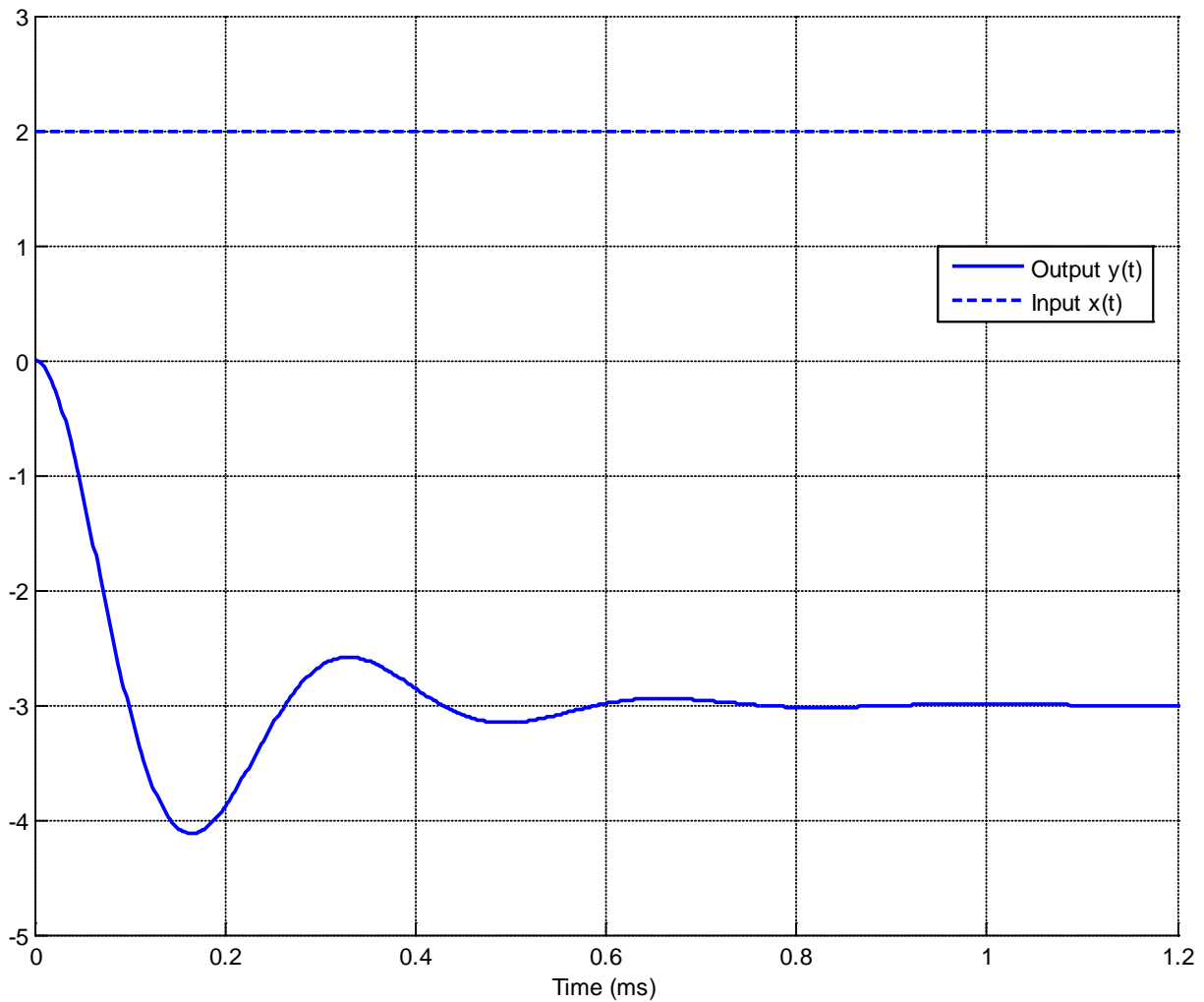
2) The best estimate of the steady state error for a **unit ramp input** is

- a) 0.0   b) 0.25   c)  $\infty$    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.



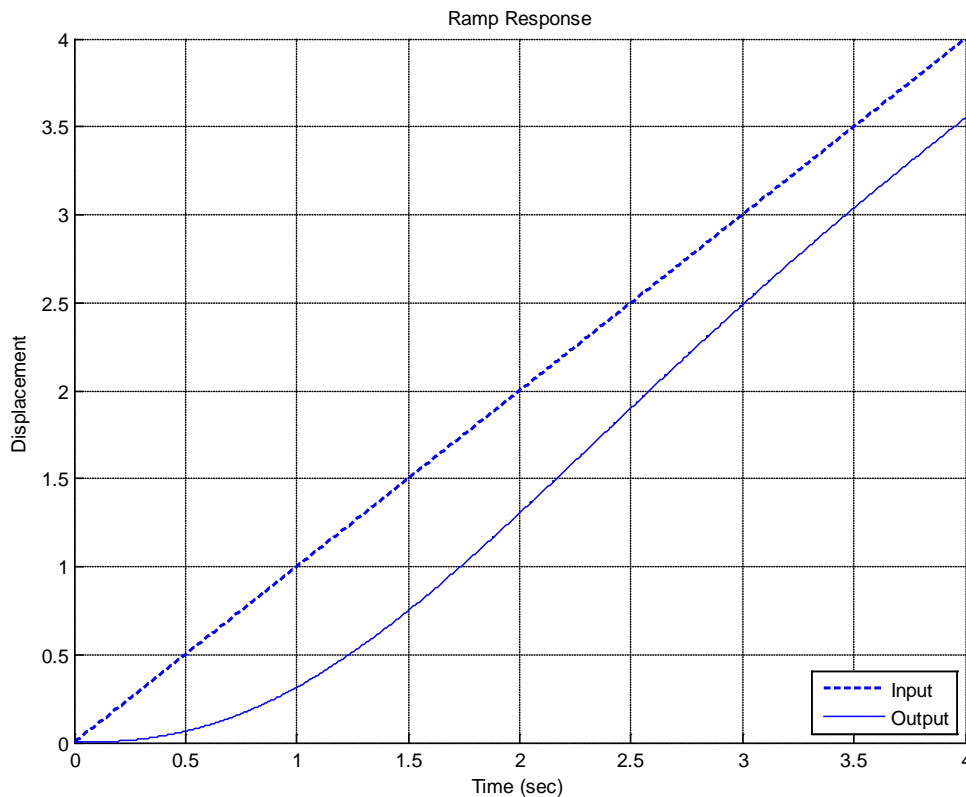
4) The percent overshoot for this system is best estimated as

- 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)  $\infty$

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

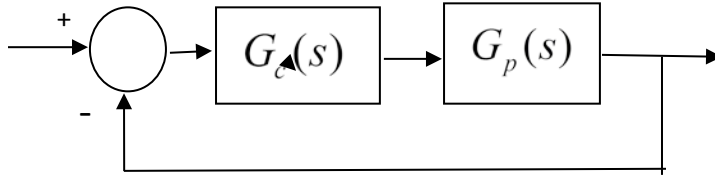
The steady state error for a unit step input for this system is best estimated as

- a)  $\infty$    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)  $\infty$

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

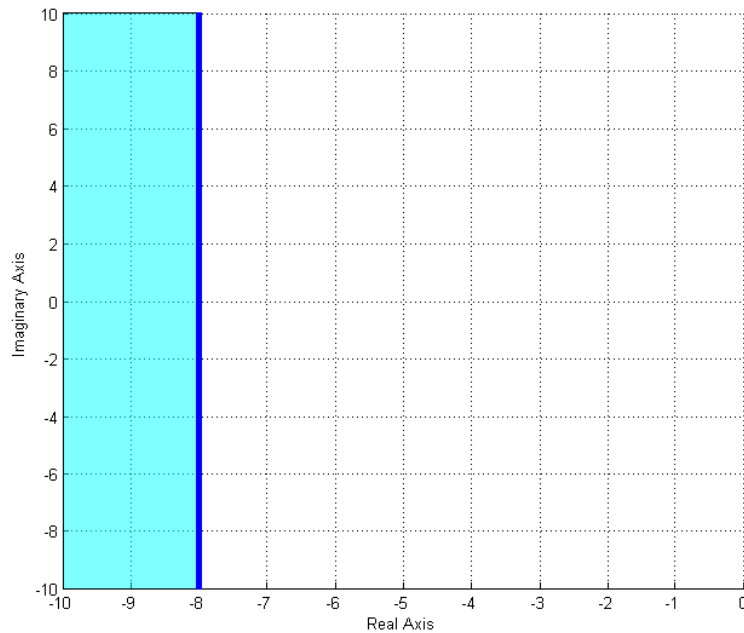
the poles of the closed loop system are at -7.1,  $-5.43 + 3.98j$ ,  $-5.43 - 3.98j$

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

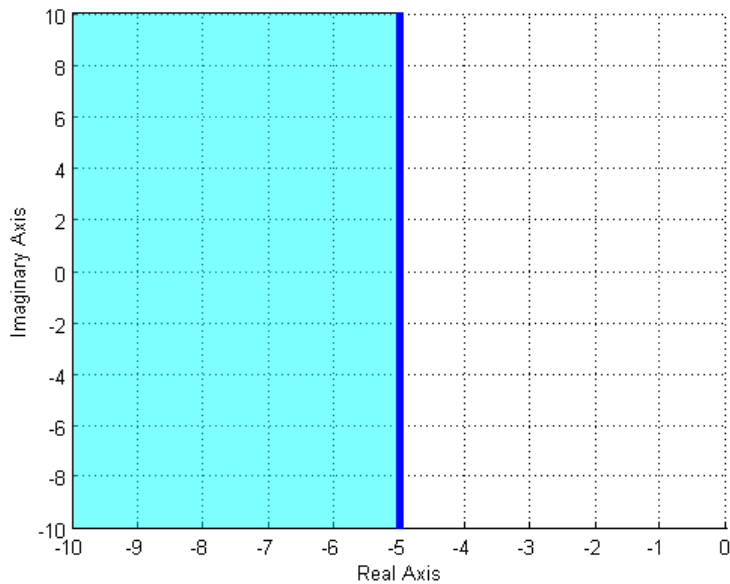
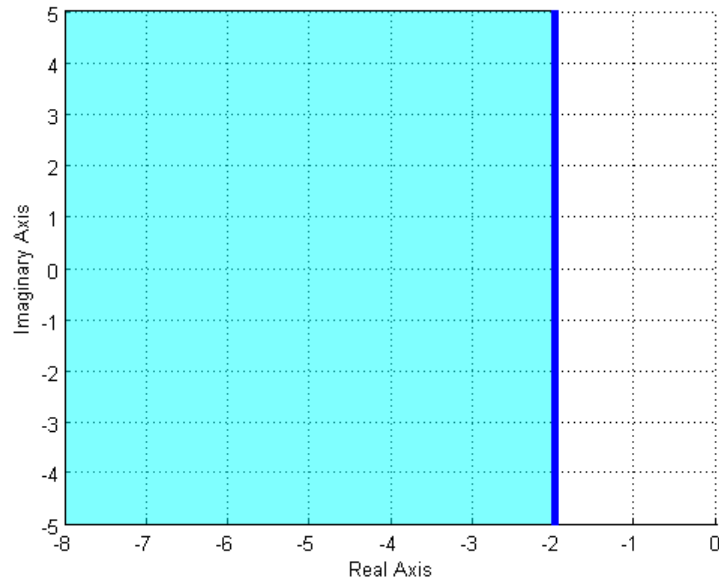
11) The (dark) shaded area in the s-plane figure below shows the possible pole location for an ideal second order system that meets which of the following constraints?

- 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



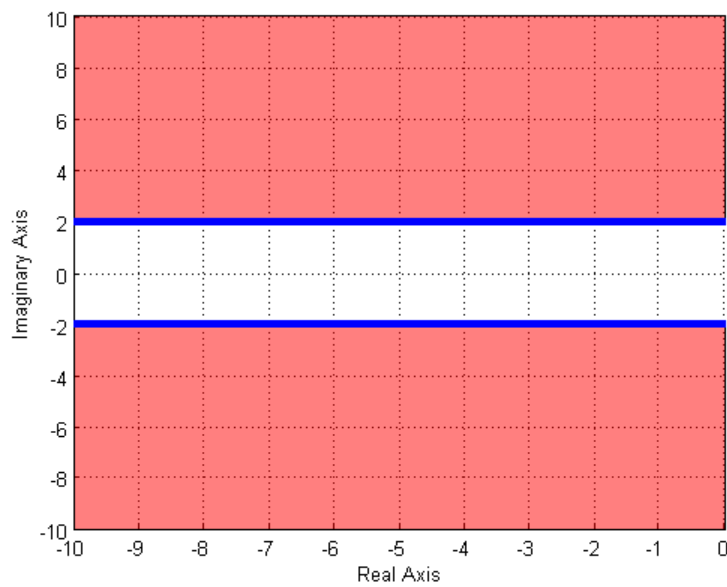
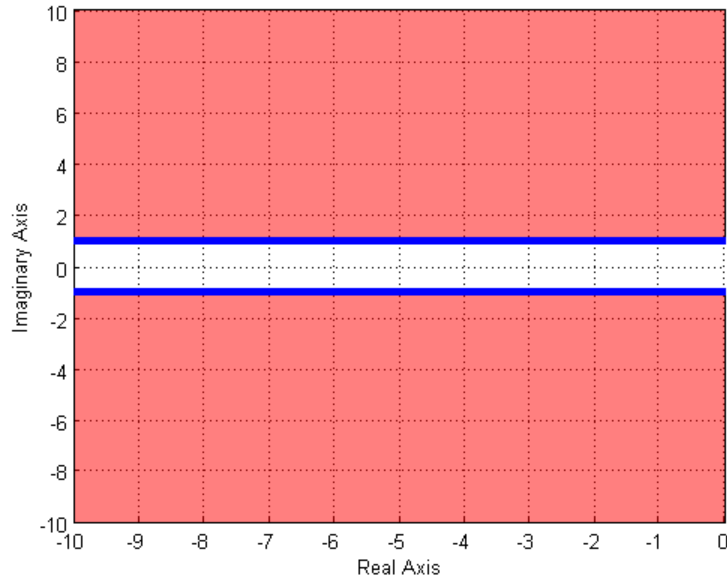
12) Assuming we are allowed to place our poles only in the (dark) shaded areas, which of the following two shaded regions will in general result in a **smaller settling time** for our system?

- 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

