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### ECE-320, Quiz #2

Problems 1 and 2 refer to a system with poles at  $-2+j$ ,  $-2-j$ ,  $-4$ ,  $-1+2j$ ,  $-1-2j$ , and  $-20$

1) The best estimate of the settling time for this system is

- a) 4 seconds    b) 2 seconds    c) 1 second    d) 0.2 seconds

2) The dominant pole(s) of this system are

- a)  $-2+j$  and  $-2-j$     b)  $-1+2j$  and  $-1-2j$     c)  $-4$     d)  $-20$

Problems 3 and 4 refer to the system described by the following transfer function

$$G(s) = \frac{bs + a}{(s + 2)(s + 4)}$$

3) For a zero steady state error for a step input, the value of  $a$  should be

- a) 0    b) 1    c) 2    d) 4    e) 6    f) 8

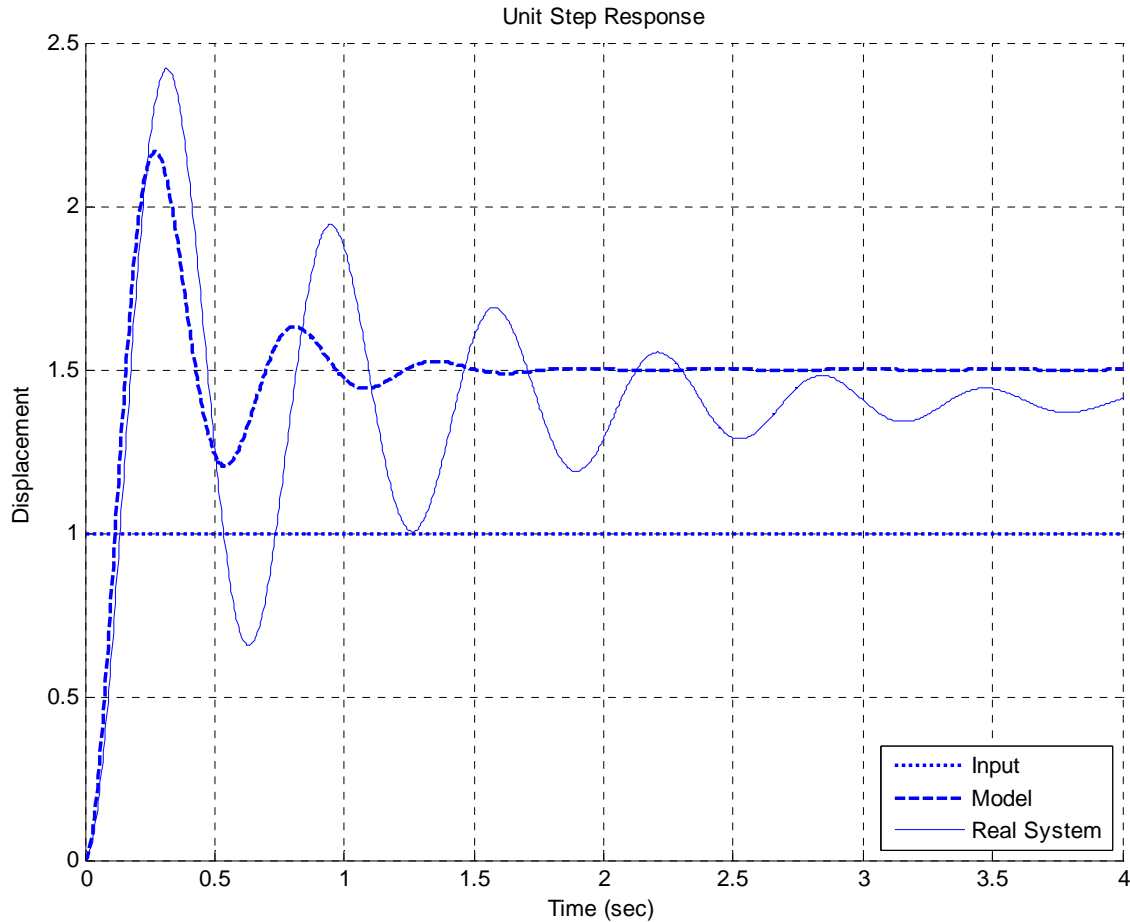
4) Assuming the value of  $a$  is chosen correctly, for a zero steady state error for a ramp input  $b$  should be chosen as

- a) 0    b) 1    c) 2    d) 4    e) 6    f) 8

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Problems 5-7 refer to the figure below, which shows the unit step response of a real 2nd order system and the unit step response of a second order model we are trying to match to the real system.



5) In order to make the model better match the real system, the *damping ratio* of the *model* should be

- a) increased
- b) decreased
- c) left alone
- d) impossible to determine

6) In order to make the model better match the real system, the *natural frequency* of the *model* should be

- a) increased
- b) decreased
- c) left alone
- d) impossible to determine

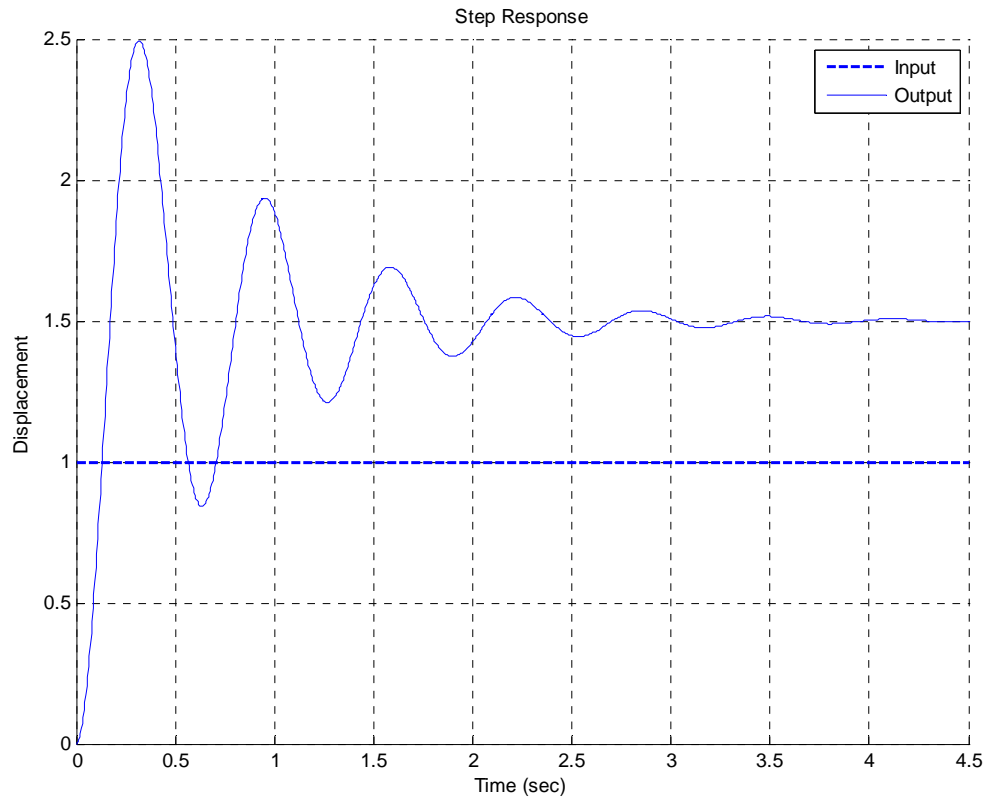
7) In order to make the model better match the real system, the *static gain* of the *model* should be

- a) increased
- b) decreased
- c) left alone
- d) impossible to determine

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Problems 8-10 refer to the unit step response of a system, shown below



8) 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

9) 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

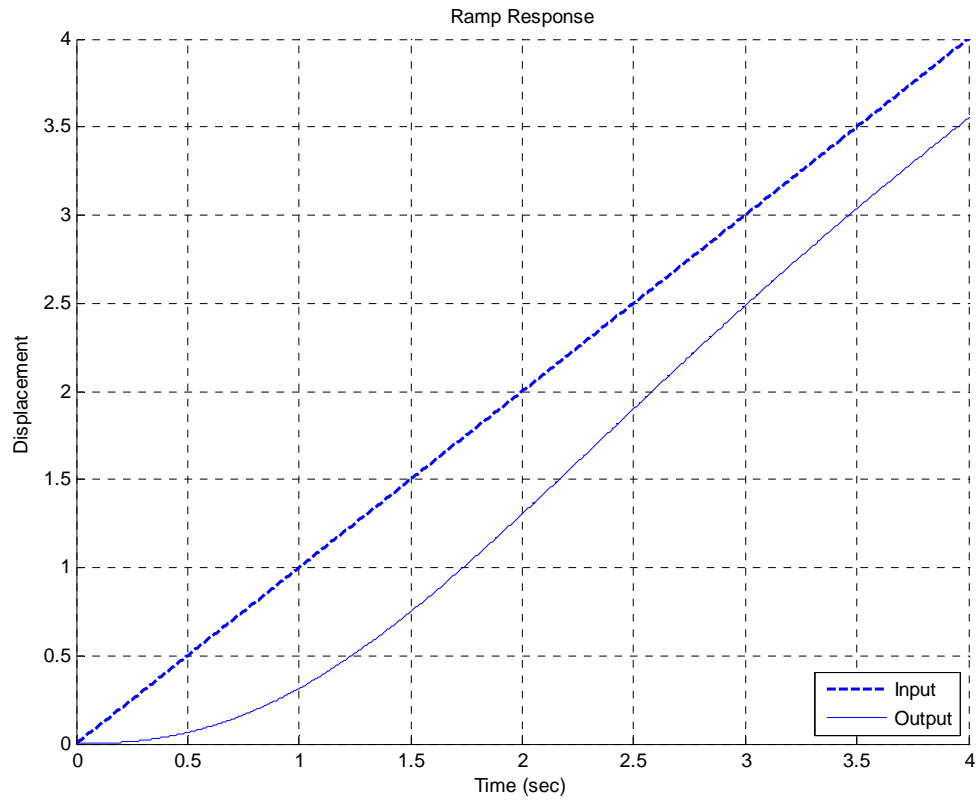
10) The best estimate of the percent overshoot is

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

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Problems 11 and 12 refer to the unit ramp response of a system, shown below:



11) 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

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

- a) 1.0   b) 0.5   c) 0.0   d)  $\infty$