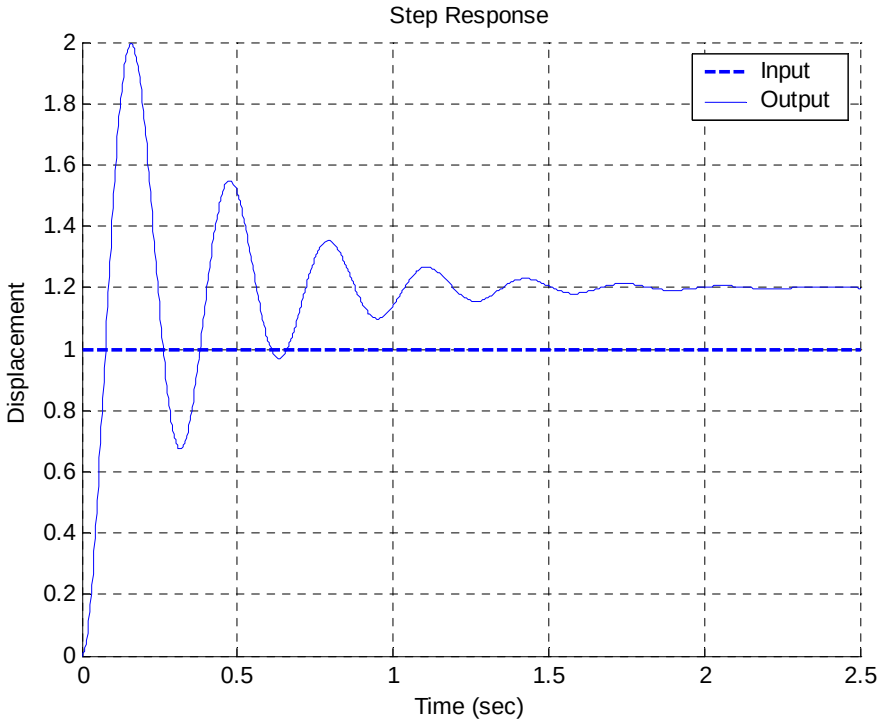
ECE-320, Practice Quiz #2

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) 0.2 b) -0.20 c) 1.0 d) -0.0

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

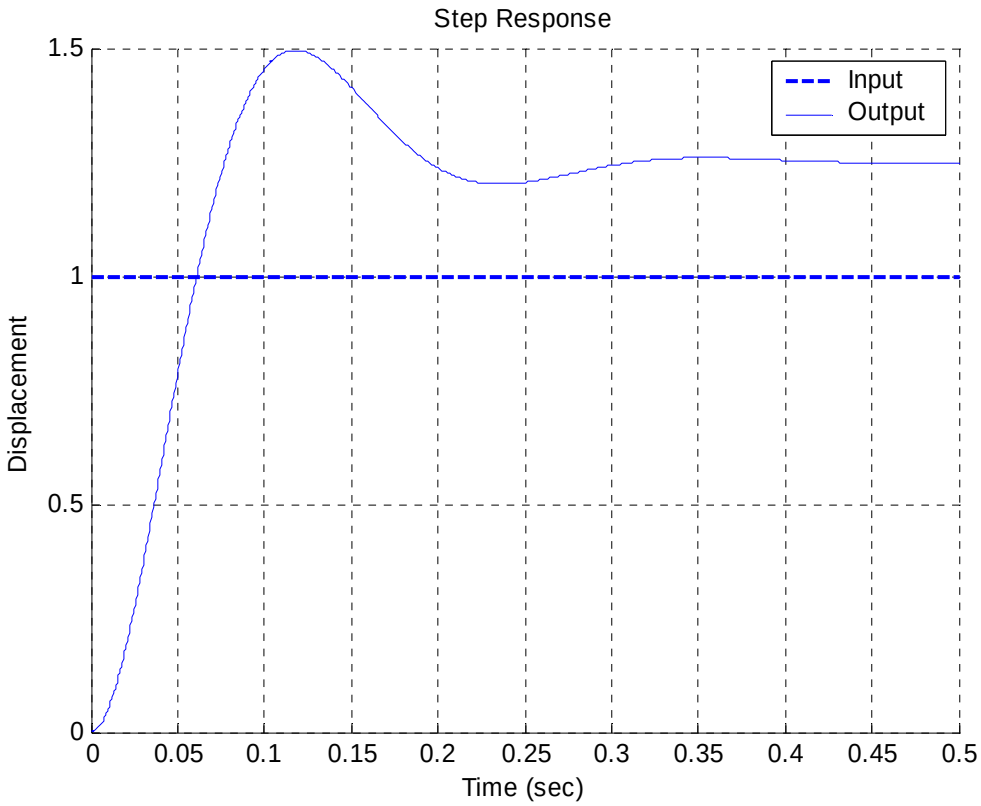
a) 200% b) 100% c) 67% d) 20%

4) The **unit step response** of a system is given by $y(t) = 0.5u(t) - tu(t) - t^4 e^{-t}u(t) + e^{-t}u(t)$

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

Problems 5-7 refer to the **unit step response** of a system, shown below



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

a) 0.50 b) 0.25 c) -0.25 d) 0.0 e) impossible to determine

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

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

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

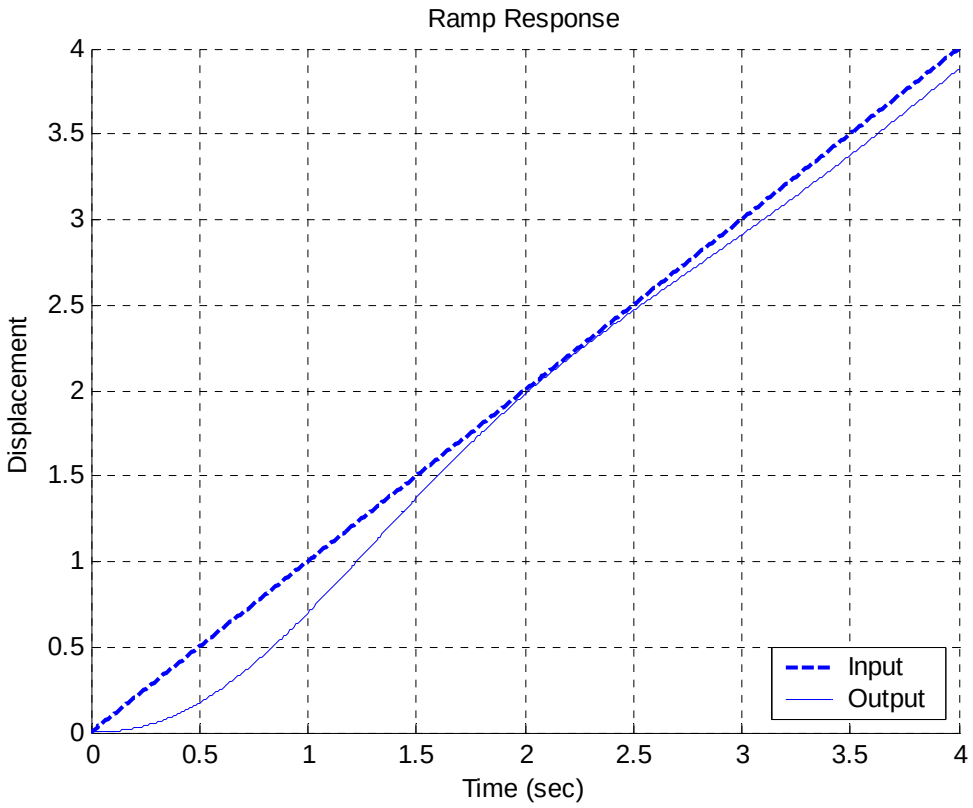
a) 20% b) 50% c) 25% d) 150%

8) The **unit step response** of a system is given by $y(t) = 0.5u(t) - t^4 e^{-t}u(t) + e^{-t}u(t)$

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

Problems 9 and 10 refer to the **unit ramp response** of a system, shown below:



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

a) 0.1 b) -0.1 c) 0 d) 0.4 e) -0.4

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

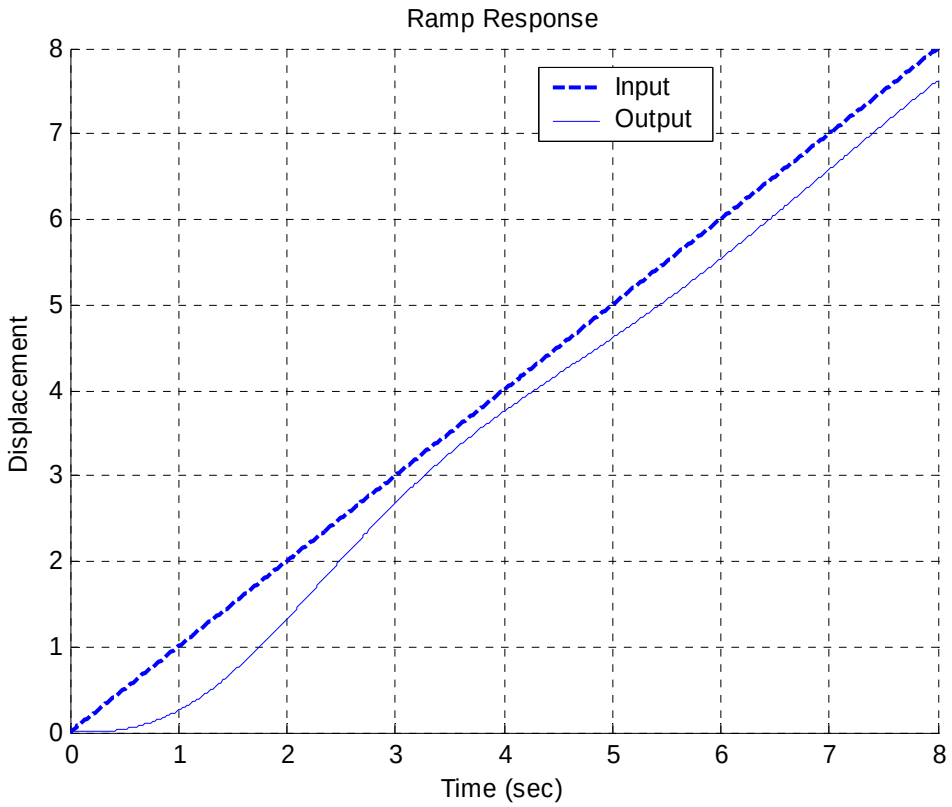
a) 1.0 b) 0.5 c) 0.0 d) ∞

11) The **unit ramp response** of a system is given by $y(t) = -0.5u(t) + tu(t) + e^{-t}u(t)$.

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

a) 0.5 b) 2.0 c) 1.0 d) ∞

Problems 12 and 13 refer to the **unit ramp response** of a system, shown below:



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

a) 0.8 b) 0.6 c) 0.4 d) 0.2

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

a) 1.0 b) 0.5 c) 0.0 d) ∞

14) The **unit ramp response** of a system is given b $y(t) = -0.5u(t) - 2tu(t) + e^{-t}u(t)$.

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

a) 0.5 b) 2.0 c) 1.0 d) ∞

Problems 15 and 16 refer to the system described by the following transfer function

$$G(s) = \frac{bs + a}{(s+1)(s+6)}$$

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

a) 0 b) 6 c) 1 d) 5

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

a) 6 b) 0 c) 1 d) 7

Problems 17 and 18 refer to the system described by the transfer function:

$$G(s) = \frac{s+1}{(s+2)(s+3)}$$

17) The ***steady state error*** for **a unit step input** for this system is best approximated as

a) 1/6 b) 2 c) 0 d) 5/6

18) The ***steady state error*** for a **unit ramp input** for this system is best approximated as

a) ∞ b) 0 c) 4/6 d) 1

Problems 19 and 20 refer to a system with poles at -2+5j. -2-5j. -10+j, -10-j, and -20

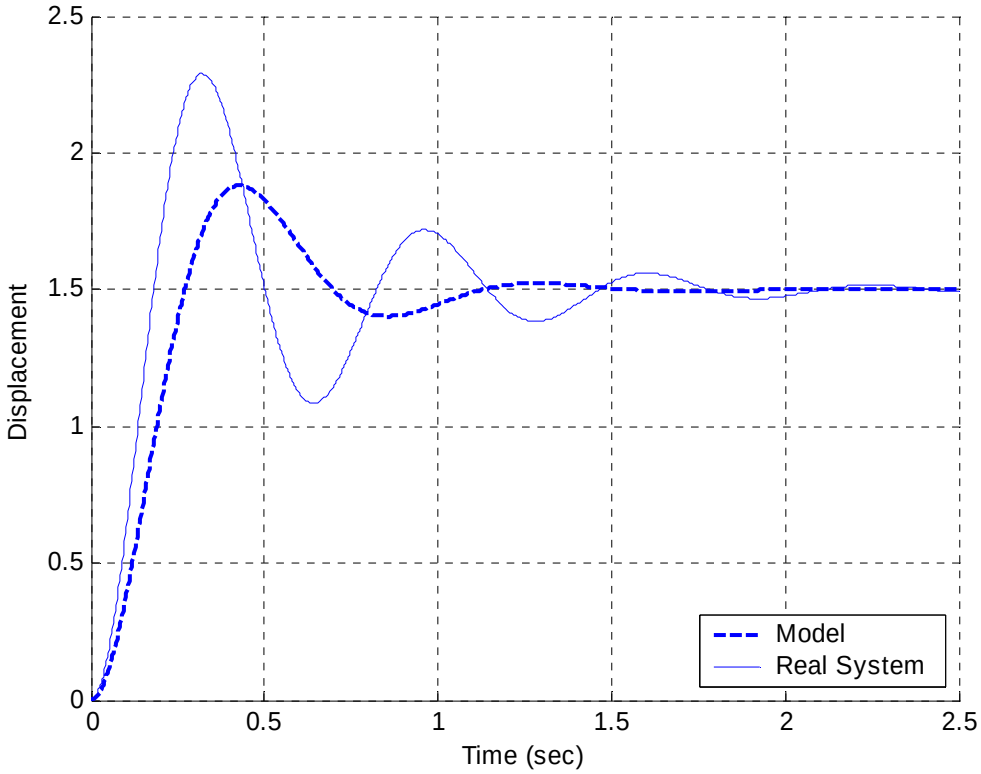
19) The best estimate of the **settling time** for this system is

a) 2 seconds b) 0.4 seconds c) 4/5 seconds d) 0.2 seconds

20) The **dominant pole(s)** of this system are

a) -2+5j and -2-5j b) -10+j and -10-j c) -20

Problems 21 and 22 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.



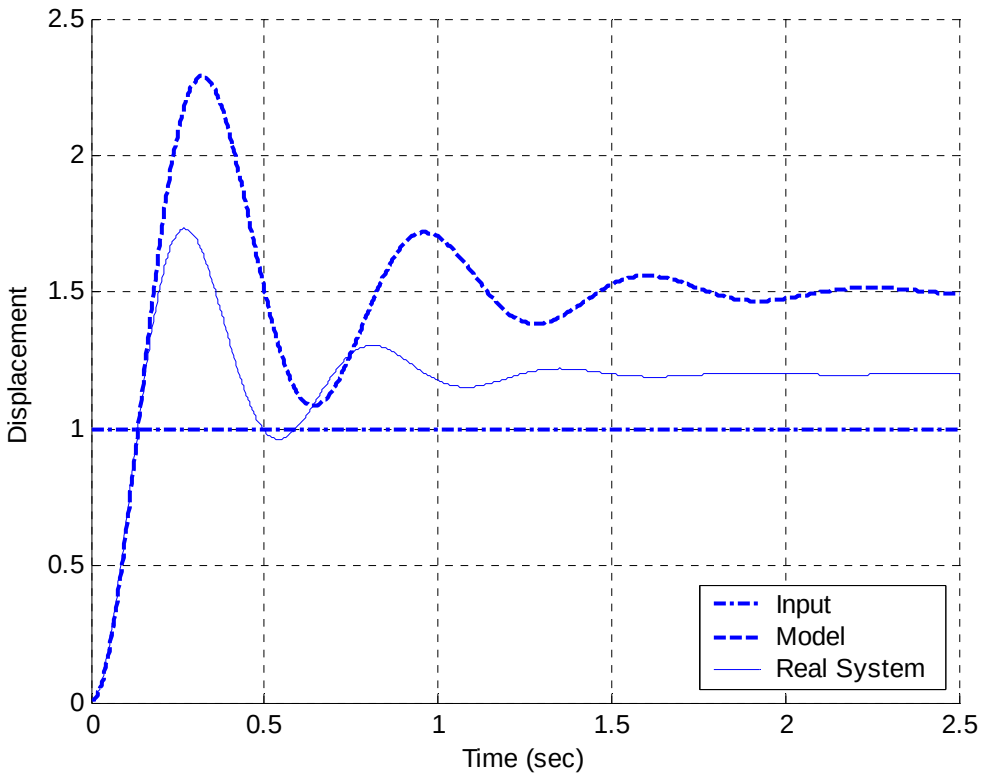
21) In order to make the model better match the real system, the ***damping ratio*** of the ***model*** should be

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

22) 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

Problems 23-25 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.



23) 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

24) 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

25) 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

Answers: 1-b, 2-c, 3-c, 4-a, 5-c, 6-c, 7-a, 8-b, 9-a, 10-c, 11-a,
12-c, 13-c, 14-d, 15-b, 16-d, 17-d, 18-a, 19-a, 20-a 21-b, 22-a, 23-a, 24-a, 25-b