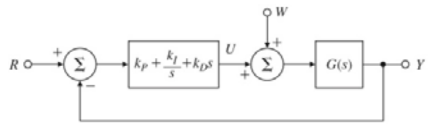
ESE 406/505 & MEAM 513 – 2013-02-20 – Quiz – Name:__________________

- Choose the one best answer for each question by circling the letter.
- A correct answer is worth 2 points.
- No answer is worth 0 points.
- An incorrect answer is worth -1 point. Random guessing will lower your score, on average.

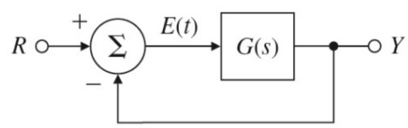
1. In the figure shown at right, with $G(s) = \dfrac{16}{s^2 + s + 16}$, the primary effect of derivative feedback is that it…?



   A. …ensures zero steady-state errors for step disturbance inputs, W(s).
   B. …ensures zero steady-state errors for step command inputs, R(s).
   C. …increases the natural frequency of the closed-loop poles.
   D. …increases the damping ratio of the closed-loop poles.

2. For the system shown in previous problem, the primary effect proportional feedback is that it…
   A. …ensures zero steady-state errors for step disturbance inputs, W(s).
   B. …ensures zero steady-state errors for step command inputs, R(s).
   C. …increases the natural frequency of the closed-loop poles.
   D. …increases the damping ratio of the closed-loop poles.

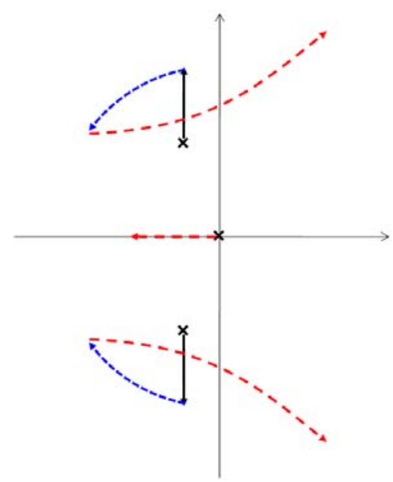
3. Suppose that the system shown in the figure at right exhibits a constant steady-state error, $\lim_{t\to\infty} E(t) = \varepsilon$, in response to a unit step command input. From this, we can infer that...



   A. $\lim_{s\to 0} G(s) = \dfrac{1-\varepsilon}{\varepsilon}$
   B. $\lim_{s\to\infty} G(s) = \varepsilon$
   C. The closed-loop system is unstable, because it does not cause the output to match the input.
   D. None of the other answers is a reasonable inference.

4. Which of the following is MOST ACCURATE concerning integral feedback?
   A. Integral feedback has virtually no effect on stability, so the only limit on how high the integral gain can go is actuator bandwidth.
   B. Integral feedback is often used on control systems to provide perfect steady-state tracking of constant inputs and perfect steady-state rejection of constant disturbances.
   C. Integral feedback is most easily and effectively designed if we ignore issues such as anti-windup protection and initialization.
   D. Integral feedback only works on first-order systems without time delay and is typically not used on more complicated systems.

5. In the figure at the right, taken from the lecture notes of 13-Feb-2013, ...



   A. ...the arrows show the movement in the complex plane of the closed-loop poles of a typical second-order system due to increasing the proportional, derivative, and integral gains (in that order) of PID controller.
   B. ...all of the other answers are correct.
   C. ...the x-axis is the real part of the poles, which is a measure of the damping.
   D. ...the y-axis is the imaginary part of the poles, which is a measure of the frequency.