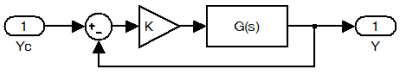
ESE 406/505 & MEAM 513 – 2012-Apr-11 – Quiz – Name:_____

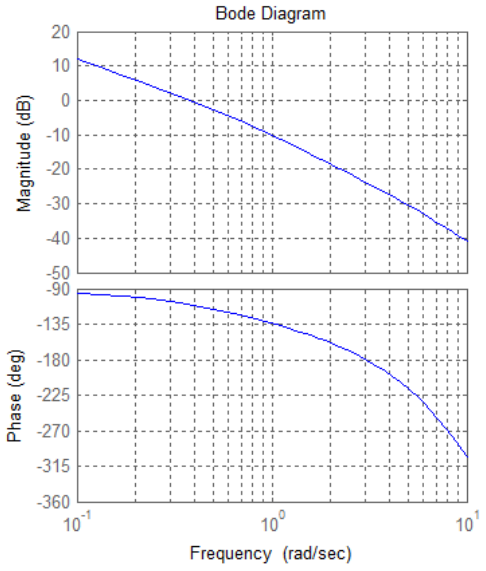
- Choose the one best answer for each question by circling the letter.
- A correct answer is worth 2 points.
- No answer is worth 0 points.
- An incorrect answer is worth -1 point. Random guessing will lower your score, on average.

1. Which of the following is MOST CORRECT about lag compensation?
   A. It has the form $\frac{s+z}{s+p}$ with $z > p$.
   B. It is used to decrease the phase at high frequency to improve noise rejection.
   C. The name "lag compensator" comes from the observation that the magnitude of the frequency response plot of a lag compensator is less than unity (0dB).
   D. All of the above.

2. Which of the following is MOST CORRECT about lead compensation?
   A. It has the form $\frac{T_1 s+1}{T_2 s+1}$ with $T_1 > T_2$.
   B. It is used to increase the phase near the crossover frequency to improve stability margins.
   C. The name "lead compensator" comes from the observation that the phase of the frequency response plot of a lead compensator is greater than zero.
   D. All of the above.



3. The bode plot shown in the figure at right represents G(s) in the block diagram shown above. For what value of K will the system have a phase margin of about 45 degrees?
   A. K ~ 16
   B. K ~ 3
   C. K ~ 1/3
   D. No value of K yields a phase margin of 45 degrees.



4. For what value of K is the system neutrally stable?
   A. K ~ 16
   B. K ~ 3
   C. K ~ 1/3
   D. The system is stable for all values of K>0.

5. The figure at right shows a generic loop bode magnitude plot. Which of the following is the LEAST CORRECT statement about the corresponding feature in the plot?
   A. High loop gain at low frequency is desirable for good tracking and disturbance rejection and this feature can often be achieved using a lag compensator.
   B. The slope of the magnitude curve should not be too high near crossover to ensure adequate stability robustness and this feature can often be achieved with a lead compensator.
   C. The frequency at which the loop gain is equal to 6dB is known as the "Doppelgänger bandwidth" and is typically specified by the system user or government contractor.
   D. Low loop gain at high frequency is desirable for good noise rejection and stability robustness and can sometimes requires notch or low-pass filters.