

## ESE 406/505 & MEAM 513 – 2013-04-10 – Quiz – Name: \_\_\_\_\_

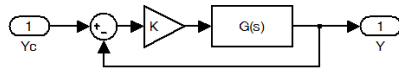
- Choose the one best answer for each question by circling the letter.
- A correct answer is worth 2 points.
- No answer is worth 0 points.
- An incorrect answer is worth -1 point. Random guessing will lower your score, on average.

1. Which of the following is MOST CORRECT about lag compensation?

- It has the form  $\frac{s+z}{s+p}$  with  $z > p$ .
- It is used to decrease the phase at high frequency to improve noise rejection.
- 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).
- All of the above.

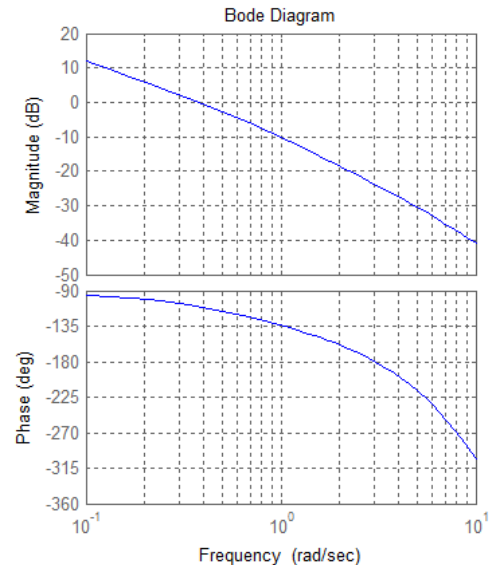
2. Which of the following is MOST CORRECT about lead compensation?

- It has the form  $\frac{T_1 s + 1}{T_2 s + 1}$  with  $T_1 > T_2$ .
- It is used to increase the phase near the crossover frequency to improve stability margins.
- The name "lead compensator" comes from the observation that the phase of the frequency response plot of a lead compensator is greater than zero.
- 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?

- $K \sim 16$
- $K \sim 3$
- $K \sim 1/3$
- No value of  $K$  yields a phase margin of 45 degrees.



4. For what value of  $K$  is the system neutrally stable?

- $K \sim 16$
- $K \sim 3$
- $K \sim 1/3$
- 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?

- 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.
- 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.
- 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.
- Low loop gain at high frequency is desirable for good noise rejection and stability robustness and can sometimes require notch or low-pass filters.

