

Name \_\_\_\_\_

Circle one: Section 1510 1610

## ME 422 – Quiz 4

Winter 2011

In giving your answer, the answer alone is not enough. Make sure you clearly give your rationale for arriving at the answer. It must be clear to me how you arrive at your answer.  
Weights:

1. For the transfer function

$$G(s) = \frac{10(s+1)}{s^2(s+10)}$$

- a. Get the system into normalized form (if it is not already in this form). This is the form of components on the Bode component sheet.

2

$$G(s) = \frac{\frac{1}{10} 10 (s+1)}{s^2 (\frac{1}{10} s+1)} = \frac{(s+1)}{s^2 (\frac{1}{10} s+1)}$$

- b. What is the system's steady-state gain?

1

$$K_{ss} = 1$$

- 3
- c. <sup>List</sup> Name the system's components, writing out beside each component name the transfer function of the component.

<sup>the name</sup>

1  $(s+1)$  - 1<sup>st</sup> order lead  $\frac{1}{\frac{1}{10} s+1}$  - 1<sup>st</sup> order lag

1  $2 \times \frac{1}{s}$  - 2x integrator  $K=1$  - gain

- d. Give the break frequencies of all the components for which it is appropriate. Identify the components to which each belongs.

2

$$s+1 - \omega_{B1} = 1 \text{ rad/sec}$$
$$\frac{1}{\frac{1}{10} s+1} - \omega_{B2} = 10 \text{ rad/sec}$$

- e. On the sheet on back, plot out the asymptotes of each component of the transfer function, both log mag and phase. Make sure you label each asymptote clearly, so

that it is easy to see which asymptote belongs to each component. Make sure to label the axes of the graphs with appropriate values.

- f. Plot the composite asymptotes of the system, both log mag and phase. Use a different marking symbol for the composite asymptotes to make sure they are distinguishable from the component asymptotes.

$$G(s) = \frac{10(s+2)}{s^2(s+10)}$$

20 pts

