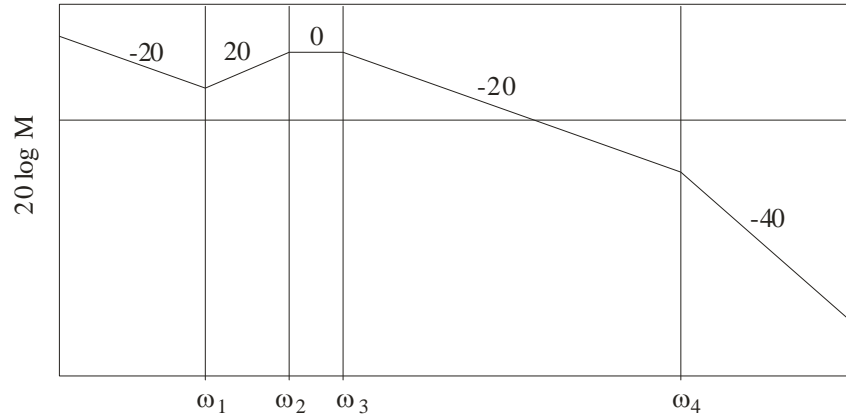


ME 422 – Quiz 4

19 November 2010

In answering this problem, show all work. It is your obligation to show clearly how you arrived at your solution, that is the complete train of logic that leads to your answer. In your solution clearly label each part of the solution with the lower case letter to which it pertains.

1.



The magnitude plot of the Bode diagram above shows the composite asymptote of an open-loop transfer function that has unity feedback. The numbers shown on the plot are the values of the slopes in dB/decade. Also, $\omega_1 = 1$ rad/sec, $\omega_2 = 3$ rad/sec, $\omega_3 = 10$ rad/sec, and $\omega_4 = 1000$ rad/sec.

- Determine the open-loop transfer function using the ω s given above.
- On the plot above, draw the asymptote for the system's gain.
- If it is possible for the real system curve (not the asymptote) to have "humps", draw the hump(s) on the above plot. Under what conditions would there be a hump, i.e. what is needed for there to be a hump?
- Draw on the plot above the static error constant that will allow you to plot a finite steady state error. What input to this system will cause this error? What will be the approximate value of e_{ss} ?
- Draw ω_{GM} or $\omega_{\Phi M}$ on the plot above. For stability, what has to be true about the phase curve at this frequency?
- Does this system have an integrator or differentiator? Explain your answer.
- What order is the above open-loop system? Explain your answer.