ECE-320, Practice Quiz #9

1) Consider the characteristic equation $\Delta(s) = s^3 + 2ks^2 + s + 1$. Using the Routh-Hurwitz array, we can determine the system is stable for

a) all $k > 0$ b) no value of k c) $0 < k < 0.5$ d) $k > 0.5$

2) Consider the characteristic equation $\Delta(s) = s^3 + s^2 + s + 2k$. Using the Routh-Hurwitz array, we can determine the system is stable for

a) all $k > 0$ b) no value of k c) $0 < k < 0.5$ d) $k > 0.5$

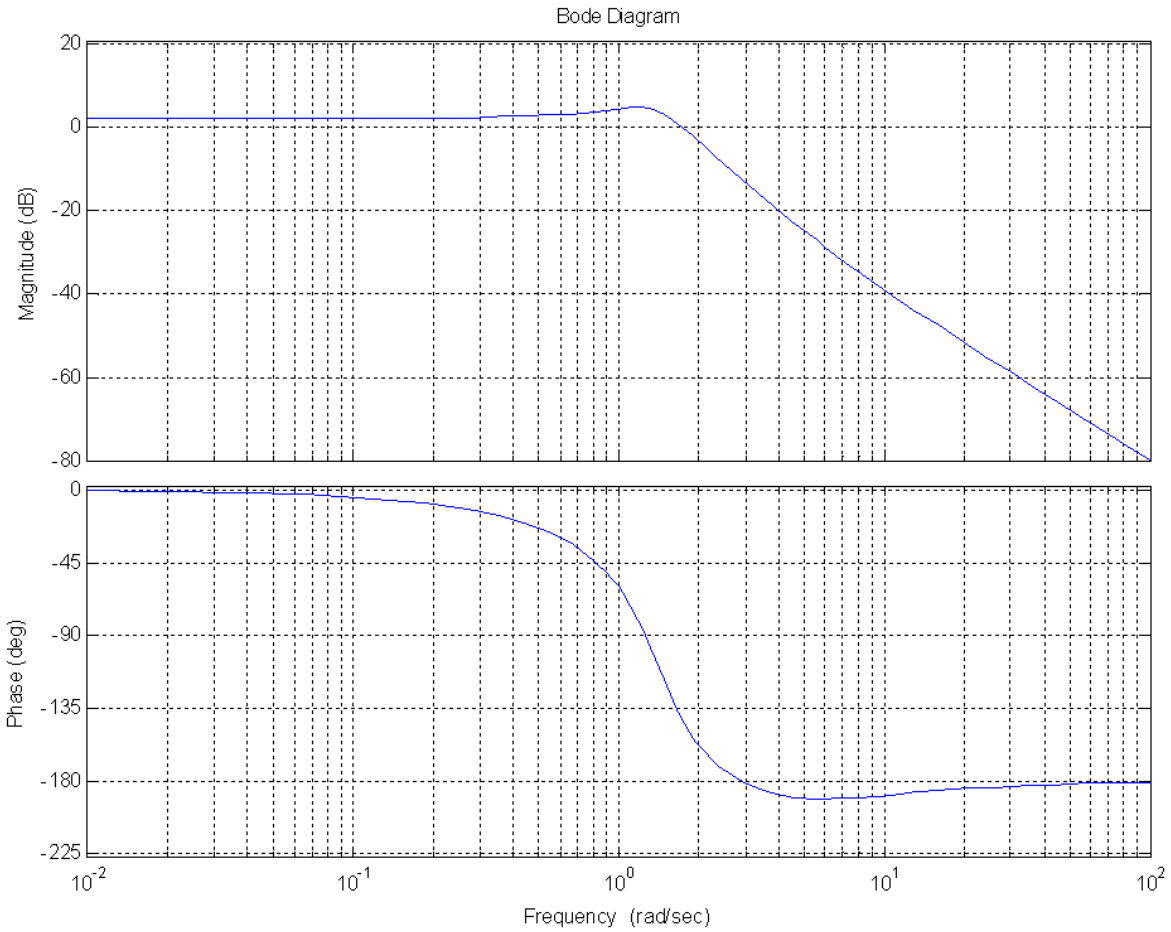
3) Consider the characteristic equation $\Delta(s) = ks^3 + s^2 + s + 1$. Using the Routh-Hurwitz array, we can determine the system is stable for

a) all $k > 1$ b) no value of k c) $0 < k < 0.5$ d) $0 < k < 1$ e) $k > 0.5$

4) Consider the characteristic equation $\Delta(s) = s^4 + 3s^3 + 2s^2 + s + k$. Using the Routh-Hurwitz array, we can determine the system is stable for

a) all $k > 1$ b) no value of k c) $0 < k < 5/9$ d) $k > 5/9$ e) all $k > 0$

Problems 5-9 refer to the following open loop Bode plot of $G(s)H(s)$



5) The *gain crossover frequency used to determine the phase margin* for this system is best estimated as

a) 0 rad/sec b) 1 rad/sec c) 1.8 rad/sec d) 12 rad/sec e) 100 rad/sec

6) The *phase crossover frequency* for this system is best estimated as

a) 0 rad/sec b) 1.8 rad/sec c) 3 rad/sec d) 30 rad/sec e) 100 rad/sec

7) The phase margin for this system is best estimated as

a) $+45^o$ b) -45^o c) $+135^o$ d) -135^o

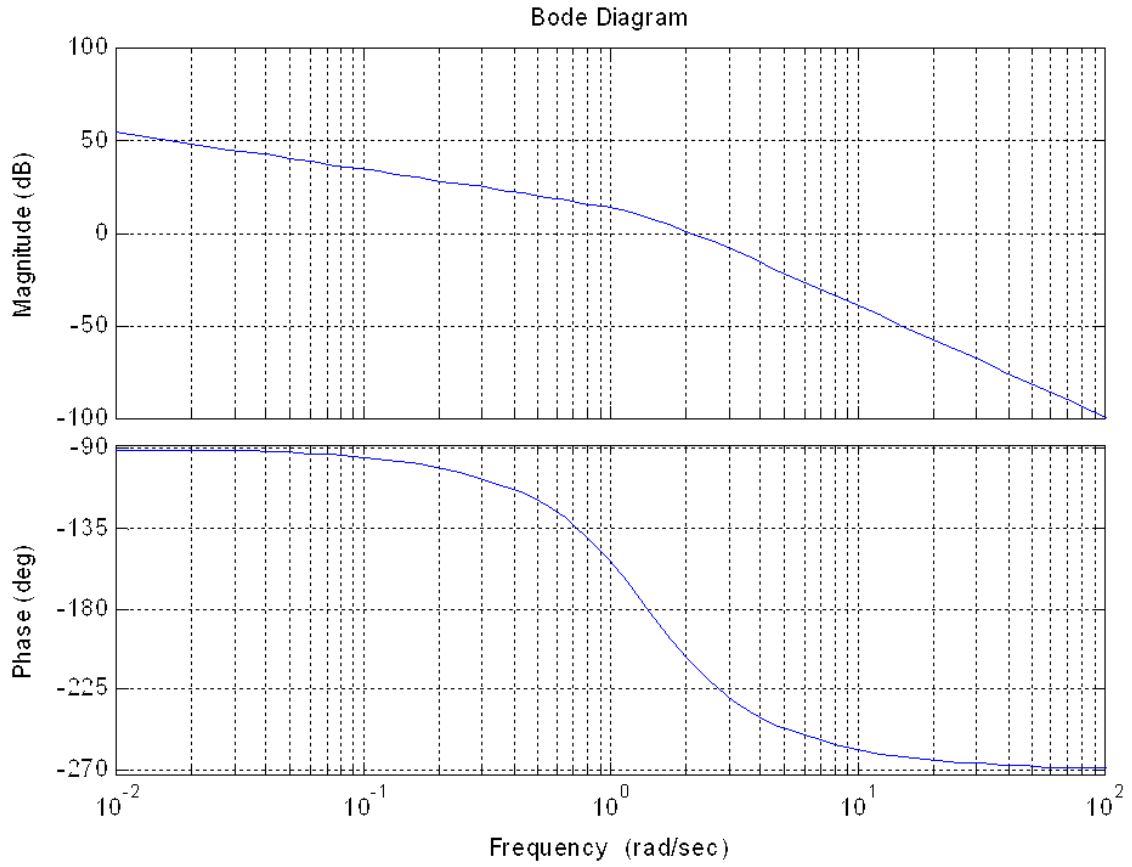
8) The gain margin for this system is best estimated as

a) +12 dB b) - 12 dB c) ∞ dB d) -2 dB

9) Assuming $G(s)H(s)$ is minimum phase, is the closed loop system **stable**?

a) Yes b) No c) impossible to determine

Problems 10-14 refer to the following open loop Bode plot of $G(s)H(s)$



10) The *gain crossover frequency used to determine the phase margin* for this system is best estimated as

a) 0 rad/sec b) 1 rad/sec c) 1.5 rad/sec d) 2 rad/sec e) 100 rad/sec

11) The *phase crossover frequency* for this system is best estimated as

a) 0 rad/sec b) 1 rad/sec c) 1.5 rad/sec d) 2 rad/sec e) 100 rad/sec

12) The phase margin for this system is best estimated as

a) $+30^o$ b) -30^o c) $+60^o$ d) -60^o

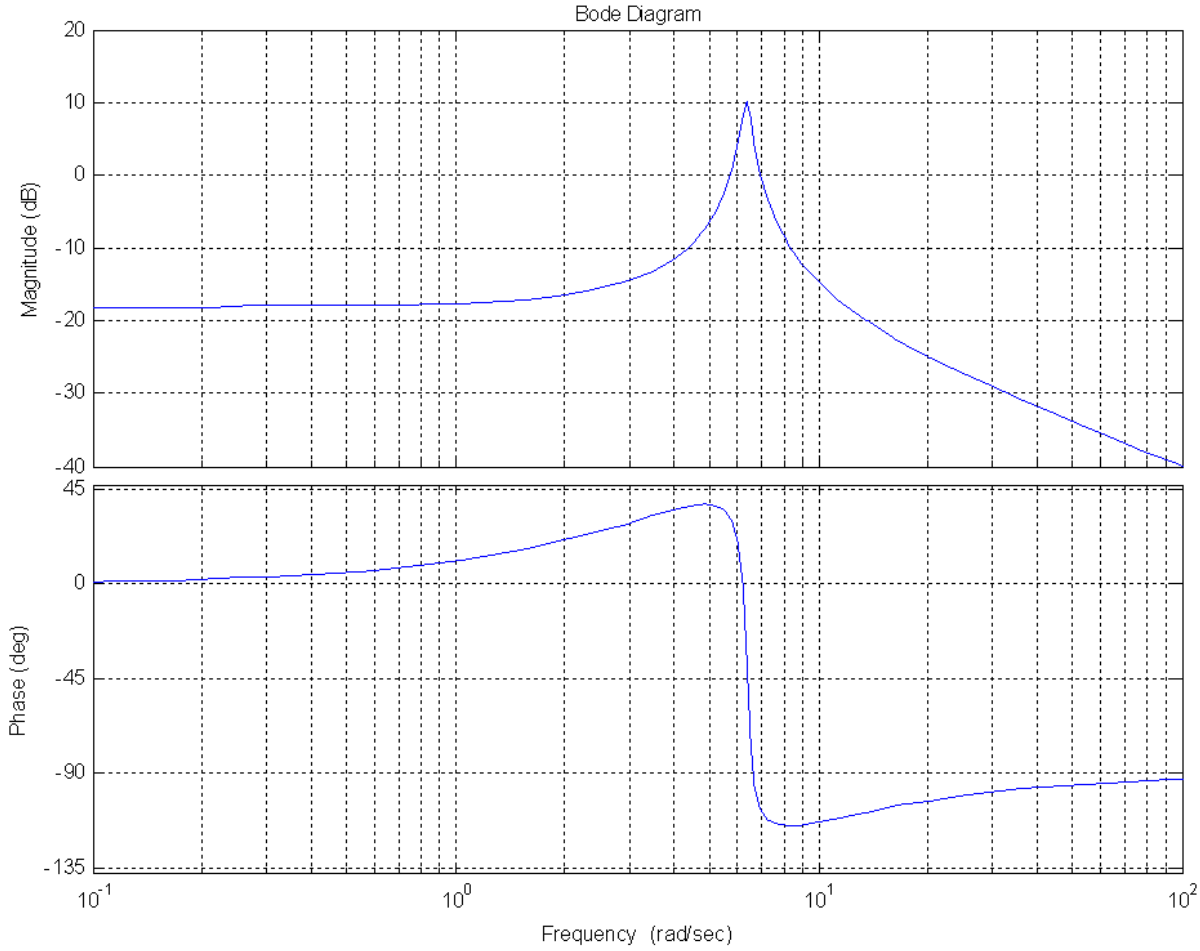
13) The gain margin for this system is best estimated as

a) +5 dB b) - 5 dB c) ∞ dB d) 0 dB

14) Assuming $G(s)H(s)$ is minimum phase, is the closed loop system **stable**?

a) Yes b) No c) impossible to determine

Problems 15-19 refer to the following open loop Bode plot of $G(s)H(s)$



15) The *gain crossover frequency used to determine the phase margin* for this system is best estimated as

a) 0 rad/sec b) 5.5 rad/sec c) 7 rad/sec d) 15 rad/sec

16) The *phase crossover frequency* for this system is best estimated as

a) 0 rad/sec b) 1 rad/sec c) 1.5 rad/sec d) 2 rad/sec e) none of these

17) The phase margin for this system is best estimated as

a) $+70^o$ b) -70^o c) $+135^o$ d) -135^o

18) The gain margin for this system is best estimated as

a) +5 dB b) - 5 dB c) ∞ dB d) 0 dB

19) Assuming $G(s)H(s)$ is minimum phase, is the closed loop system **stable**?

a) Yes b) No c) impossible to determine

Answers:1-d, 2-c, 3-d, 4-c,5-c, 6-c, 7-a, 8-a, 9-a, 10-d, 11-c, 12-b, 13-b, 14-b, 15-c, 16-e, 17-a, 18-c, 19-a