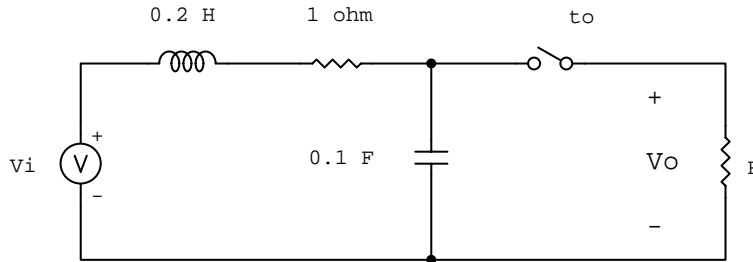# EE 380- 1 Control Engineering I, Final

7:30 PM - 10:00 PM January 23, 2008, Wednesday, Dr. Ahmad A. Masoud

Q1 (7 marks): For the circuit shown below, select a value for R so that when the switch (to) is closed, the following specifications are met:

1- at steady state Vo ≥ 0.8·Vi,   2- the percentage overshoot δ ≤ 32%   3- the settling time Ts ≤ 1.33 sec


Q2 (7 marks): If the unity feedback system shown below has the listed properties, determine G(S):

1- K is positive
2- G(S) is a third order system with no zeros
3- the steady state error for a step input is zero
4- the response of the closed loop system changes from overdamped to underdamped at $\sigma = -1/3$
5- the system changes states from stable to unstable at K=2
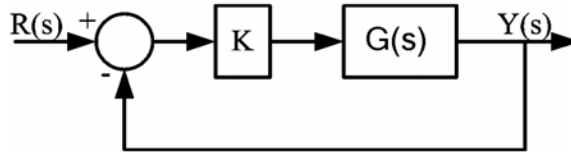
Q3 (4 marks) mathematically compute the gain margin of the system shown below: (4 marks)
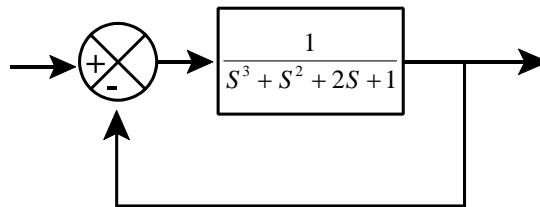
Q4 (4 marks) the magnitude bode plot shown below is for a minimum phase system, determine its transfer function: (4 marks)
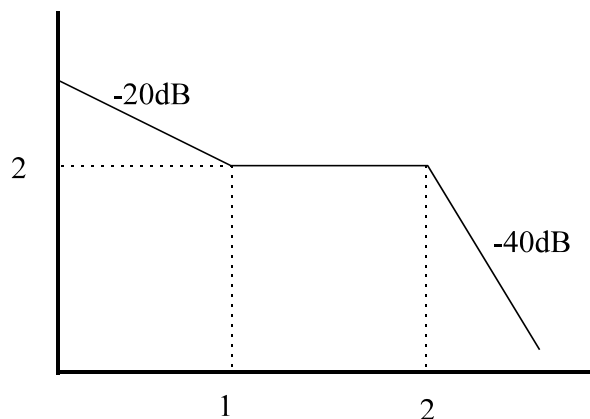
Q5 (8 marks)

Design a P-controller for the system with transfer function G(S) so that the following specifications are met:

1- Ts ≤ 5 sec
2- δ ≤ .31 for a unit step input.

The rootlocus of the unity feedback system with G(S) as the forward transfer function is shown below for K: 0 →∞ .

Root Locus