ECE 486: Control Systems Assignment # 04

Issued: Nov 30 Due: Dec 06, 2023

Question 1

The transfer function $G(s) = \frac{s+1}{s+\sqrt{3}}$ has a complex variable $s = \sigma + j\omega$.

a) Find $|G(s)|$ and $\angle(G(s))$, when the complex variable is at coordinates *(3 Points)*

(i) $(\sigma, \omega) = (0,1)$
(ii) $(\sigma, \omega) = (0,100)$
(iii) $(\sigma, \omega) = (0,0.1)$

b) Sketch the Bode plot of the frequency response $G(j\omega)$ *(3 Points)*

Question 2

Consider the open-loop transfer function $KG(s) = \frac{K}{s^3+6s^2+5s}$

a) When K = 10, the bode plot is given by Figure 1. Indicate the frequency values on the diagram where there are changes in the magnitude slope. (2 Points)

Given the Gain Margin (GM)=+8 dB, Phase Margin (PM)=+21°, on the bode plot on Figure 2, label (i) GM and (ii) PM. (2 Points)

b) Suppose we look at K=100.

(i) Sketch the Bode diagram (4 Points)
(ii) Write down the new GM (2 Points)
(iii) Show graphically on your sketch, how you would measure the new PM. (2 Points)

c) Comment on the choice of K value. (2 Points)