ECE 351 Lab 7

Zachary DeLuca

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1 Introduction

2 Math

Transfer function of Open Loop:

$$H(s) = \frac{Y(s)}{X(s)} = \frac{X(s)A(s)G(s)}{X(s)} = \frac{\frac{s+4}{s^2+4s+3}\frac{s+9}{(s^2-6s-16)(s+4)}}{1}$$

$$\frac{(s+4)(s+9)}{(s+3)(s+1)(s+4)(s-8)(s+2)} = \frac{(s+9)}{(s+3)(s+1)(s-8)(s+2)}$$

Zeros: -9
Poles: -3, -1, 8, -2

$$Y = E * G = X * A - Y * B = X * AG - Y * BG$$

$$Y(1+BG) = X(AG) \rightarrow \frac{Y}{X} = H(s) = \frac{AG}{1+BG} = \frac{\frac{s+4}{s^2+4s+3}\frac{s+9}{(s^2-6s-16)(s+4)}}{1+\frac{s+9}{(s^2-6s-16)(s+4)}(s+12)(s+14)}$$

$$H(s) = \frac{\frac{s+4}{(s+1)(s+3)}\frac{s+9}{(s-8)(s+2)(s+4)}}{1+\frac{s+9}{(s-8)(s+2)(s+4)}(s+12)(s+14)}$$

$$H(s) = \frac{(s+9)}{(s+1)(s+3)(s+2)(s-8)(1+\frac{(s+9)(s+12)(s+14)}{(s-8)(s+2)(s+14)})}$$

$$H(s) = \frac{(s+9)}{(s+1)(s+3)(s+2)(s-8)(s+12)(s+14)(\frac{(s-8)(s+2)(s+4)+(s+9)}{(s-8)(s+2)(s+4)})}$$

$$H(s) = \frac{(s+9)(s+4)}{(s+1)(s+3)(s+12)(s+14)((s-8)(s+2)(s+4)+(s+9))}$$