ECE 388

Automatic Control

LAB 9

Nyquist Plot

Objectives: The Nyquist plot is a very useful tool for determining the stability of a system. It has advantages over the root locus and Routh-Horwitz because it easily handles time delays . it also gives us insight on how to improve the stability of a system. The objective of this exercise is to study Nyquist method in the determination of stability of systems in control engineering practice.

List of Equipment/Software

MATLAB, Simulink

TASKS:

1)

a. Sketch (by hand) the Nyquist plot of the following transfer functions

$$L_1(s) = \frac{100}{s(s+2)(s+3)}$$

$$L_2(s) = \frac{90}{(s+3)(s+6)}$$

b. Compare your result in **a** to the Nyquist plot obtained in Matlab (command **nyquist**).

2) The following three open-loop transfer functions are given

i.

$$G_{o1}(s) = \frac{85(s+1)(s^2+2s+43.25)}{s^2(s^2+2s+82)(s^2+2s+101)}$$

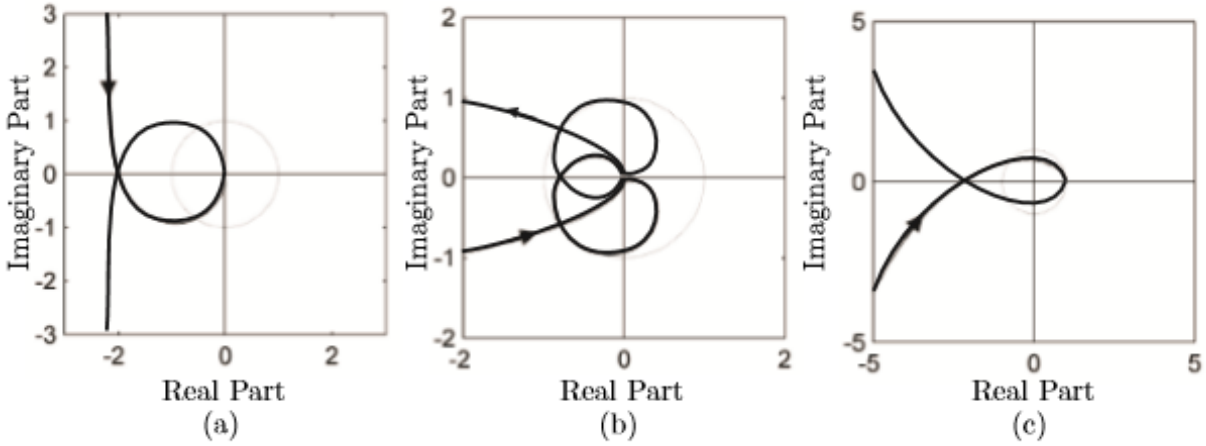
ii.

$$G_{o2}(s) = \frac{s^4+2s^3+1.5s^2+3.5s+4}{s(s+1)^3}$$

iii.

$$G_{o3}(s) = \frac{20(s+1)}{s(s-10)}$$

a.Match the above 3 functions to the following Nyquist plots.



b. Verify your result by using Matlab.