

Experiment no.8: Nyquist Stability

Object:

Creating the Nyquist

Introduction:

From a Nyquist plot, we can tell a number of closed-loop poles on the right half plane. If there is any closed-loop pole on the right half plane, the system goes unstable. If there is no closed-loop pole on the right half plane, the system is stable.

Command :

nyquist(num,den)

Cases:

$$1 - G(s) = \frac{20}{s(1+2s)(1+s)}$$

$$2 - G(s) = \frac{1+4s}{s^2(1+s)(1+2s)}$$

$$3 - G(s) = \frac{10(1-s)}{(s+1)}$$

$$4 - G(s) = \frac{60}{(1+s)(s+2)(s+5)}$$

Discussions:

- 1 - Discusses the Stability of each case?
- 2 - Draw the Nyquist path of all cases by using Matlab program and rules (Theoretical).
- 3 - Compare between the theoretical solution and the results of program .

Experiment no.9:

Bode Diagram (Frequency – domain plots)

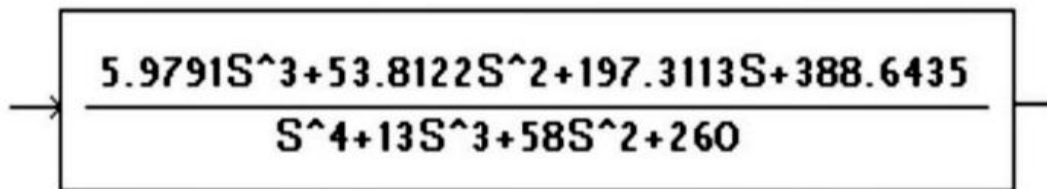
Object:

Creating a bode diagram

Theory:

Matlab makes it extremely easy to create frequency – domain plots using the command bode.

1. for known transfer function:



A block diagram representing a transfer function. It consists of a rectangular box with an input arrow on the left and an output arrow on the right. Inside the box, the transfer function is written as a fraction: the numerator is $5.9791S^3 + 53.8122S^2 + 197.3113S + 388.6435$ and the denominator is $S^4 + 13S^3 + 58S^2 + 260$.

program:

```
clf
num=[0 5.979 53.8122 197.3113 388.6435];
den=[1 13 58 0 260];
bode(num , den)
```

2.for known zeros &poles of the system:

program:

```
clf
z=[-2 -2+5*i -2-5*i];
p=[-1 -5 -7 -1+7*i -1-7*i];
k=(35*50)/(2*29) %k is chosen to give a d.c. gain of 1
[num , den]=zp2tf(z' , p' , k);
bode(num,den)
```

Cases:

$$1 - G(s) = \frac{1000}{s(1 + 0.1s)(1 + 0.001s)}$$

$$2 - G(s) = \frac{20}{s(1 + 0.5s)(1 + 0.05s)}$$

$$3 - G(s) = \frac{20}{s(0.2s + 1)}$$

$$4 - G(s) = \frac{30}{s(1 + 0.1s)(0.2s + 1)}$$

Discussions:

1-Discusses the Stability of each cases-?

2-Draw the bode diagram of all cases by using Matlab program and rules (Theoretical).

3-Compare between the theoretical solution and the results of program.