# CONTROL SYSTEMS (5th EE & IE)
# COMPUTER LABORATORY

## ASSIGNMENT 5

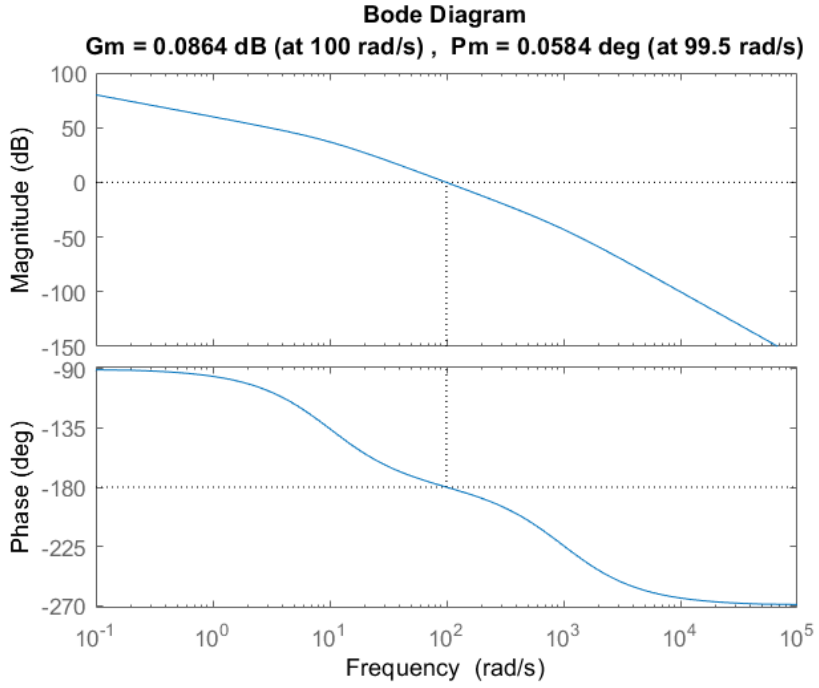
**Test 1**: Sketch the Bode plot for the transfer functions

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

MATLAB Code:

```
% define the numerator and denominator of the expression
num =[0 0 0 1000];
den=[ 0.0001 0.101 1 0];

% express the expression as transfer function
sys=tf(num, den);

% specify the frequency range
w = logspace(-1,3);

% return the magnitude and phase of frequency response at the
frequencies w.
[mag, phase] = bode(sys,w);

% compute and plot the bode plot
margin(sys)
```

Figure window:

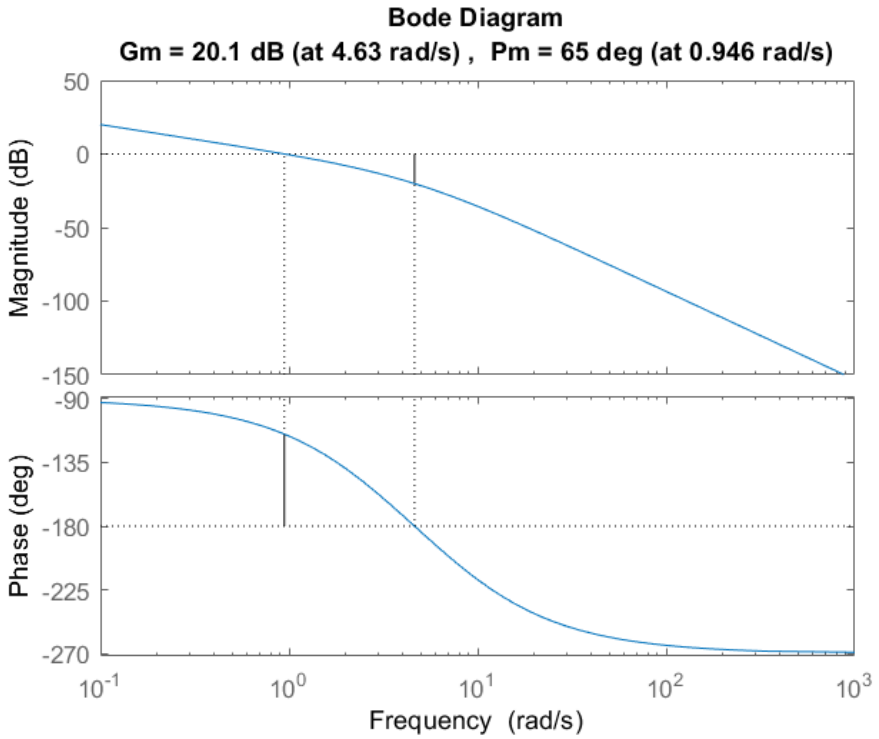


(b) $G(s) = \dfrac{15}{s(s+3)(0.7s+5)}$

MATLAB Code:

```
% define the numerator and denominator of the expression
num= [0 0 0 21.42857];
den = poly([0 -3 -7.14285]);

% express the expression as transfer function
sys=tf(num, den);

% specify the frequency range
w = logspace(-1,2);

% return the magnitude and phase of frequency response at the
frequencies w.
[mag, phase] = bode(sys,w);

% compute and plot the bode plot
margin(sys)
```

Figure window:



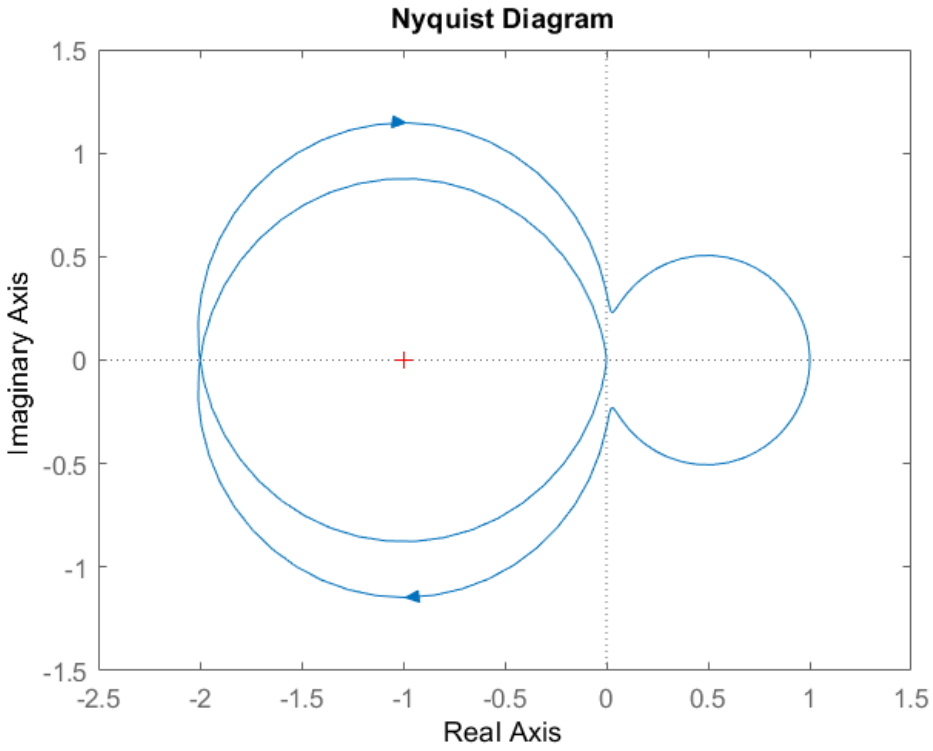
**Test 2:** Sketch the Nyquist plot for the transfer functions

$$\text{(a)}\ \ G(s) = \frac{1}{s^3 + 0.3s^2 + 5s + 1}$$

MATLAB Code:

```
% define the numerator and denominator of the expression
num =[0 0 0 1];
den = [ 1 0.3 5 1];

% express the expression as transfer function
sys =tf(num,den);

% set w = {wmin, wmax}
w= {0,100};

% returns the real and imaginary parts of the frequency response
[re, im]=nyquist(sys, w);

% compute and plot the nyquiest plot
nyquist(sys)
```

Figure window:



(b) $G(s) = \dfrac{K(s+1)(s+3+7i)(s+3-7i)}{(s+1)(s+3)(s+5)(s+3+7i)(s+3-7i)}$

MATLAB Code:

```
% define the numerator and denominator of the expression
num = poly([-1 -3-7i -3+7i]);
den = poly([-1 -3 -5 -3-7i -3+7i]);

% express the expression as transfer function
sys =tf(num,den);

% returns the real and imaginary parts of the frequency response
[re, im]=nyquist(sys, w);

% compute and plot the nyquiest plot
nyquist(sys)
```

Figure window: