ELEC-C8201: Control Theory and Automation

Exercise 6

The problems marked with an asterisk (⋆) are not discussed during the exercise session. The solutions are given in MyCourses and these problems belong to the course material.

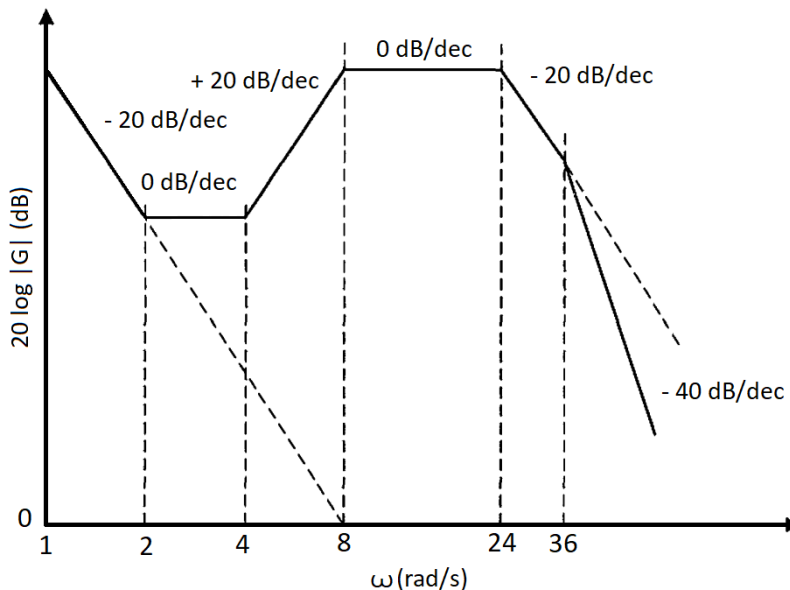1. Plot the frequency response of $G(j\omega)$

$$G(s) = \frac{5000}{(s+70)(s+500)}$$

   a) Find the magnitude of $G(j\omega)$ at $\omega = 10$

   b) Find the magnitude of $G(j\omega)$ at $\omega = 500$

   c) Find the phase of $G(j\omega)$ at $\omega = 700$

   d) Is the system stable (by using the Bode plot)?

2. The magnitude plot of a transfer function

$$G(s) = \frac{K(1+0.5s)(1+as)}{s(1+s/8)(1+bs)(1+s/36)}$$

   is shown in the following figure.

   Determine K, a, and b from the plot.

3. Sketch the Bode plot of the frequency response for the following transfer functions:

a)

$$G = \frac{5(4s^2 + 1.4s + 1)}{(s+3)^2}$$

b)

$$G = \frac{4(s + 0.5)(s^2 + 3s + 2)}{(4s + 1)(9s^2 + 4s + 1)(s + 3)}$$