Control System Homework 6

1.

CP8.1 Consider the closed-loop transfer function

$$T(s) = \frac{25}{s^2 + s + 25}.$$

Develop an m-file to, obtain the Bode plot and verify that the resonant frequency is 5 rad/s and that the peak magnitude $M_{p\omega}$ is 14 dB.

2.

CP8.4 A unity negative feedback system has the loop transfer function

$$L(s) = G_c(s)G(s) = \frac{150}{s(s + 10)}.$$

Determine the closed-loop system bandwidth. Using the bode function obtain the Bode plot and label the plot with the bandwidth.

3.

CP8.9 Design a filter, $G(s)$, with the following frequency response:

1. For $\omega < 1$ rad/s, the magnitude $20 \log_{10}|G(j\omega)| < 0$ dB
2. For $1 < \omega < 1000$ rad/s, the magnitude $20 \log_{10} |G(j\omega)| \geq 0$ dB
3. For $\omega > 1000$ rad/s, the magnitude $20 \log_{10} |G(j\omega)| < 0$ dB

Try to maximize the peak magnitude as close to $\omega = 40$ rad/s as possible.