Lab Report

Lab #5: Control Design using Frequency Response

Reported By: Jiadong Hong, Di Wu
Lab TA: Yunze Shi

i. (A) $\frac{0.404s + 1}{0.0126s + 1}$

(B) $\frac{1.21s + 3}{2.176*(0.0126s^3 + s^2 - 0.370s - 29.4)}$

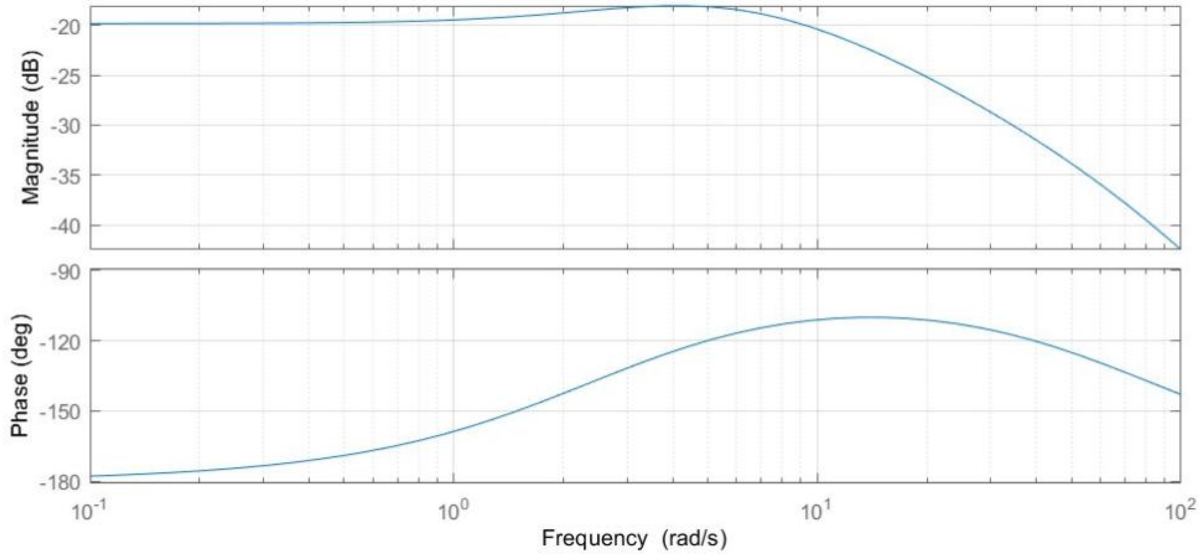
(C) $\frac{1.21s + 3}{0.0126s^3 + s^2 - 0.370s - 29.4}$

(E) 22.2rad/s

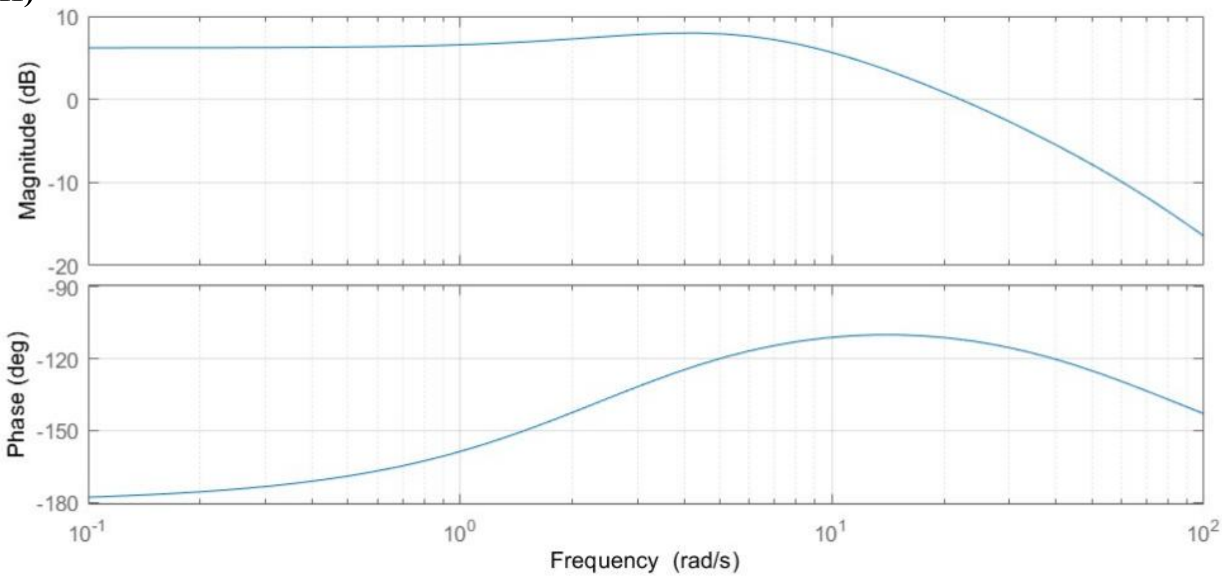
(F) GM = -6.2 dB, PM = 68°

(G) 1s

ii.(I)



(II)



iii. Beside lead compensator, what other compensation approach(es) using frequency response are there? What are their features and differences?

There are lag compensation and PI-Control. The lag compensation lags the phase of the response and approximates the PI control. As for lag compensator, it always meet the inequality that $Z > P$. The PI-Control adds steady-state tracking of constant reference and rejections of constant disturbance.

Lead compensators works as dynamic compensators for approximate PD control.It contributes to system stability but amplifies noise.

How shall we select the right compensator?

The frequency characteristic determines the compensator type. A phase lead or lag should be added according to calculation. Configurations of compensators are indicated by the locations of poles and zeros in Bode plots and Nyquist plots. Trial-and-error method is of help to figure out the appropriate configurations adequate for stability.