ENG 4550 – Introduction to Control Systems
Lab 1

YORK UNIVERSITÉ UNIVERSITY redefine THE POSSIBLE.

SRV02 Modeling Part 1 – Frequency Response Experiment

Try to identify K and τ

1.1.2.1 Frequency Response

the generic first-order system form given in Equation 1.1.1. By substituting $s = j\,w$ in this equation, we can find the frequency response of the system as:

$$\frac{\Omega_l(\omega\, j)}{V_m(\omega\, j)} = \frac{K}{\tau\omega\, j + 1} \tag{1.1.30}$$

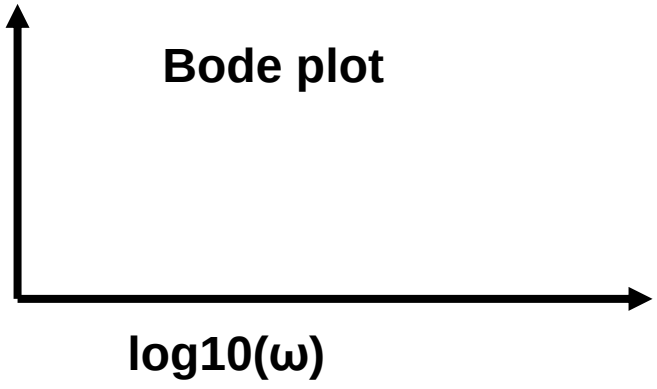
Then, the magnitude of it equals

$$|G_{wl,v}(\omega)| = \frac{K}{\sqrt{1 + \tau^2\,\omega^2}} \tag{1.1.31}$$

Let's call the frequency response model parameters $K_{e,f}$ and $\tau_{e,f}$ to differentiate them from the nominal model parameters, K and τ, used previously. The steady-state gain or the DC gain (i.e. gain at zero frequency) of the model is:

$$K_{e,f} = |G_{wl,v}(0)| \tag{1.1.32}$$

$If\ \omega = 1/\tau$?



ω is the input frequency.

Steps

1. **Read Quick Start Guide: Rotary Servo Base Unit. Connect SRV02, DAQ board and amplifier.**
   - Only Tachometer is needed (why?). The default channel in q_srv02_mdl.mdl is 1.
   - If you are using VoltPAQ X2, replace 6. 5-pin DIN to 4x RCA cable with RCA to RCA cable.
   - An additional power supply is needed for Q8-USB.
   - **ASK YOUR TA DOUBLE-CHECK THE CONNECTION BEFORE TURNING ON THE POWER.**
2. **Configuring the SRV02 according to Section 1.4.2 in Workbook.**
3. **Setup** q_srv02_mdl.mdl
   - Double-click on the QUARC HIL Initialize block. Select the data acquisition device you are using. Click on the Defaults and **OK** button.
   - Before building the model, click QUARC -> Set Default Options to avoid the possible target error.

Steps

4. **Follow the Steps in Section 1.3.1 to conduct experiments.**
   - Pay attention to the difference between f(Hz) and ω(rad/s)
5. **Turn off the power and clean up your desk.**

Typos

1. **In Section 1.3.1.1, Step 1.**

• Wave form: sine • Amplitude: 1.0 • Frequency: 0.0 • Units: Hertz	⇨ • Wave form: sine • Amplitude: 1.0 • Frequency: any value • Units: Hertz

2. **Figure 1.7 is not correct with 2 V input.**