INTRODUCTION TO CONTROL (034040)

TUTORIAL 1

Question 1. Draw the asymptotic Bode magnitude plots of the transfer function

$$G(s) = \frac{k}{(\tau_1 s + 1)(\tau_2 s + 1)},$$

where $\tau_1 > 0$ and $\tau_2 > 0$.

Question 2. Draw the Bode and polar plots for the following transfer functions:

1. $G_1(s) = \dfrac{1}{(\tau s + 1)^2}$ for $\tau > 0$;

2. $G_2(s) = \dfrac{k}{s(\tau s + 1)}$ for $\tau > 0$ and $k > 0$;

3. $G_3(s) = \dfrac{\tau_2 s + 1}{\tau_1 s + 1}$ for $\tau_1 = \frac{1}{3}$ and $\tau_2 = \frac{5}{3}$ and then for $\tau_1 = \frac{5}{3}$ and $\tau_2 = \frac{1}{3}$.

Question 3. Simplify the block-diagram in Fig. 1 and find the transfer function $T_y(s)$ from r to y and $T_u(s)$ from r to u.
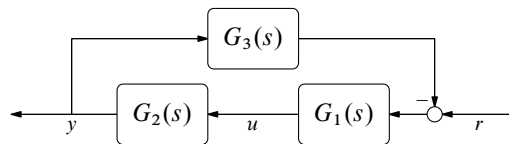

Fig. 1: Block-diagram for Question 3

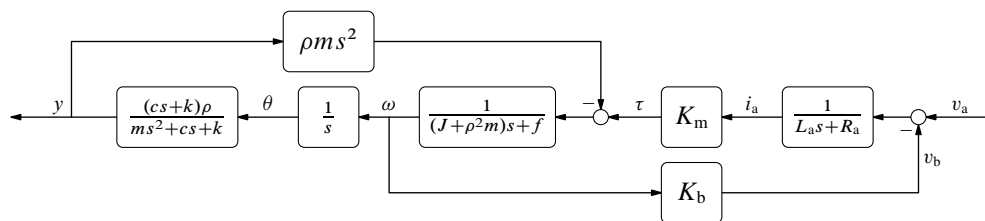**Question 4.** Simplify the block-diagram in Fig. 2 and find the transfer function $P(s)$ from v_a to y.

Fig. 2: Block-diagram for Question 4