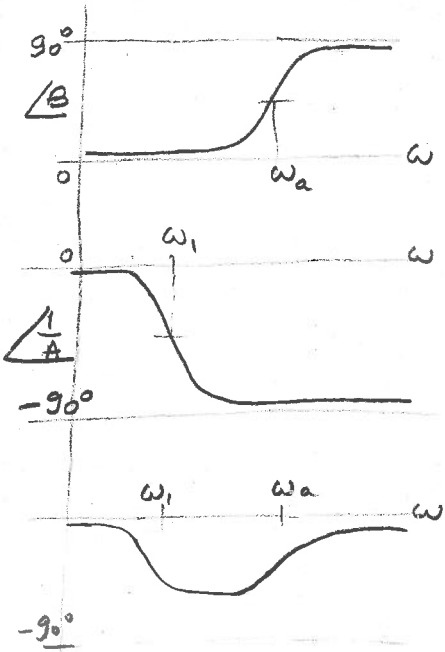
C4

# LAG COMPENSATOR

$$G_c = \frac{sT_a+1}{sT_1+1}$$

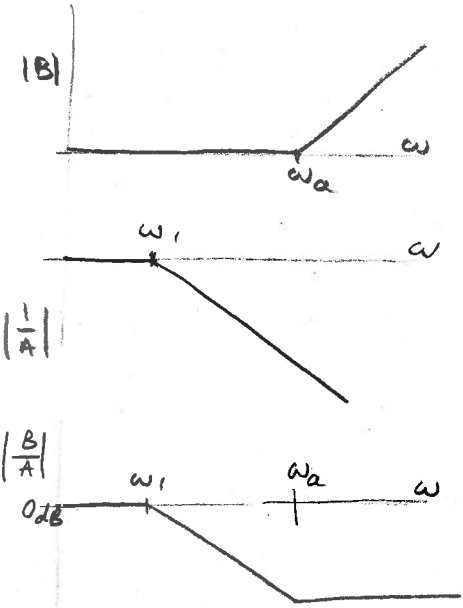
$\omega_1 < \omega_a$ , $T_a < T_1$

– Phase –

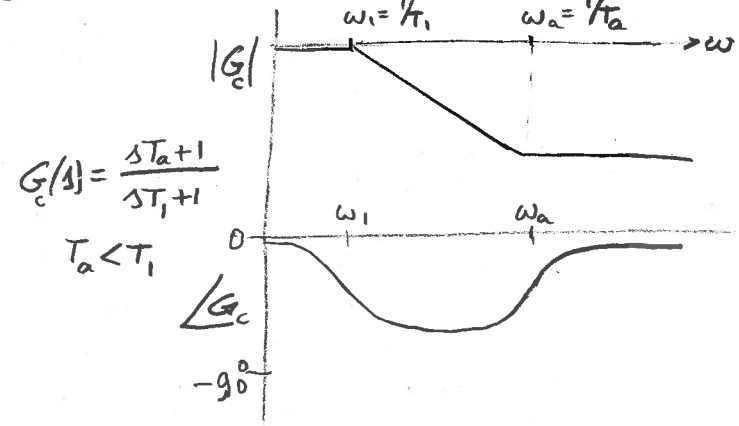



Adds "lag" between $\omega_1$ & $\omega_a$

– Gain –




Low pass filter
(higher freq. are reduced)



# LAG-LEAD COMPENSATOR
## (NOTCH FILTER)

$$G_c = \frac{sT_a+1}{sT_1+1}\cdot\frac{sT_b+1}{sT_2+1}$$

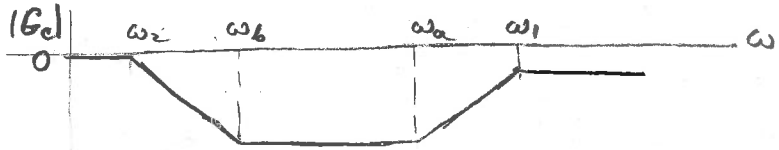
$G_c(i0) = 1$

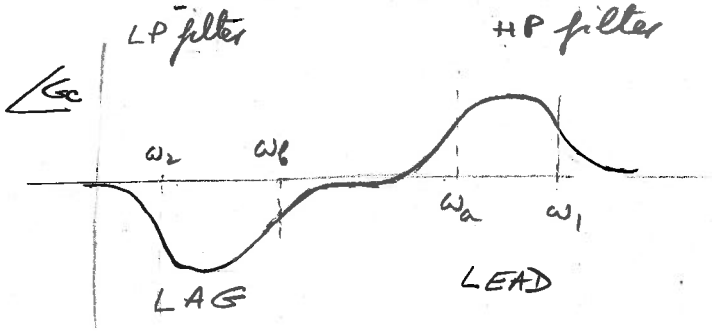
$G_c(i\infty) = \frac{T_a}{T_1}\cdot\frac{T_b}{T_2}$

lead lag

$T_1 < T_a < T_b < T_2$

$\omega_1 > \omega_a > \omega_b > \omega_2$

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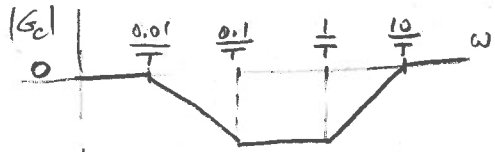
Example (Fig 11.35, p 648) $G_c = \frac{s+1}{0.1Ts+1}\cdot\frac{10Ts+1}{100Ts+1}$



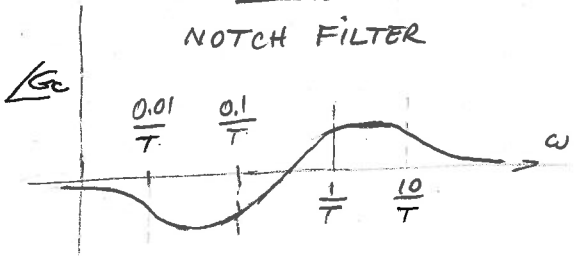

T: $0.1T < T < 10T < 100T$

ω: $\frac{10}{T} > \frac{1}{T} > \frac{0.1}{T} > \frac{0.01}{T}$

NOTCH FILTER

$G(i0) = 1$ (0 dB)

$G(i\infty) = 1$ (0 dB)



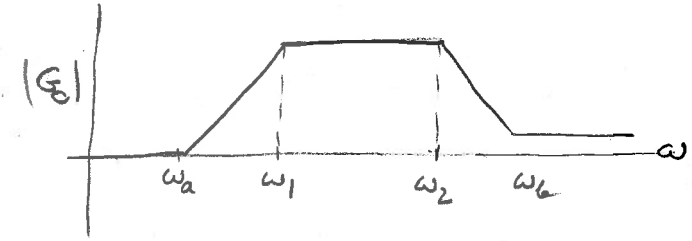
C6

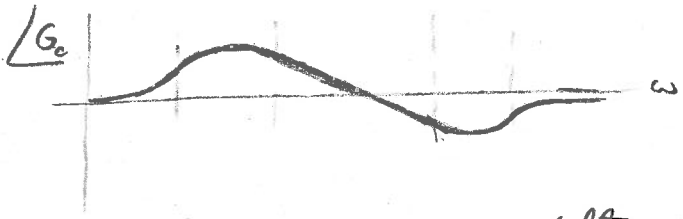
# LEAD–LAG COMPENSATOR (BAND PASS FILTER)

$$G_c = \frac{sT_a + 1}{sT_1 + 1} \cdot \frac{sT_b + 1}{sT_2 + 1}$$

$$\omega_a < \omega_1 < \omega_2 < \omega_b$$

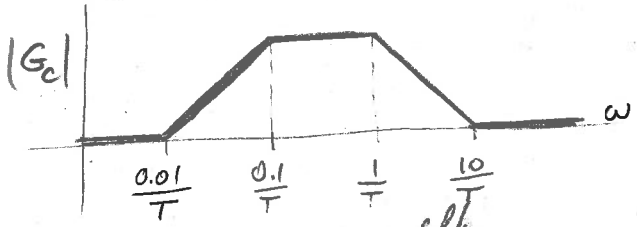
$$T_a > T_1 > T_2 > T_b$$




Example : Band pass filter

$$G_c = \frac{100Ts + 1}{10Ts + 1} \cdot \frac{0.1Ts + 1}{Ts + 1}$$




Band pass filter

C6a

Notch filter

Example

$$G_c = \frac{Ts+1}{0.1Ts+1} \cdot \frac{10Ts+1}{100Ts+1}$$

$T_1 \quad T_a \quad T_b \quad T_2$

$$0.1T < T < 10T < 100T$$

$$\omega_1 > \omega_a > \omega_b > \omega_2$$

$$\frac{10}{T} > \frac{1}{T} > \frac{0.1}{T} > \frac{0.01}{T}$$

$$\omega_2 < \omega_b < \omega_a < \omega_1$$

$$\frac{0.01}{T} \quad \frac{0.1}{T} \quad \frac{1}{T} \quad \frac{10}{T}$$