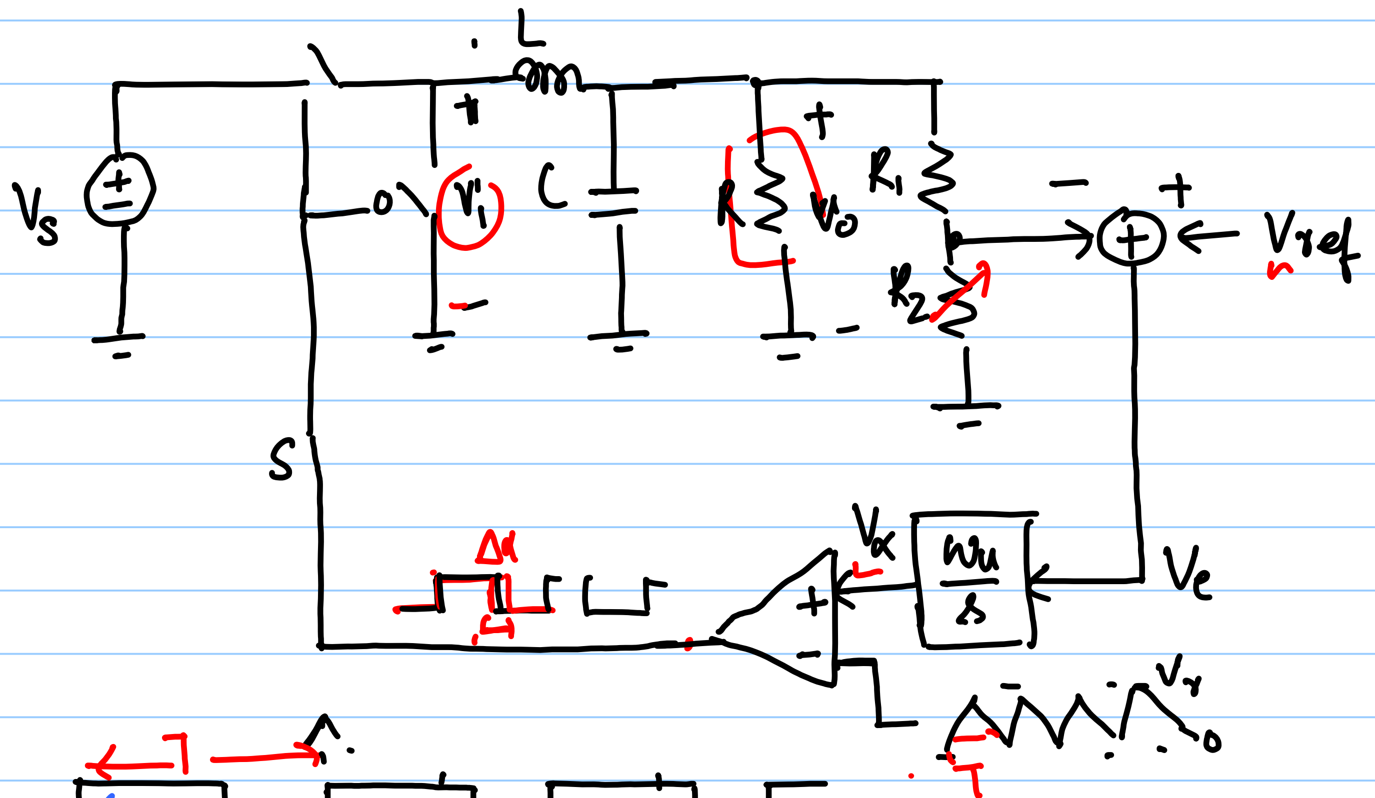
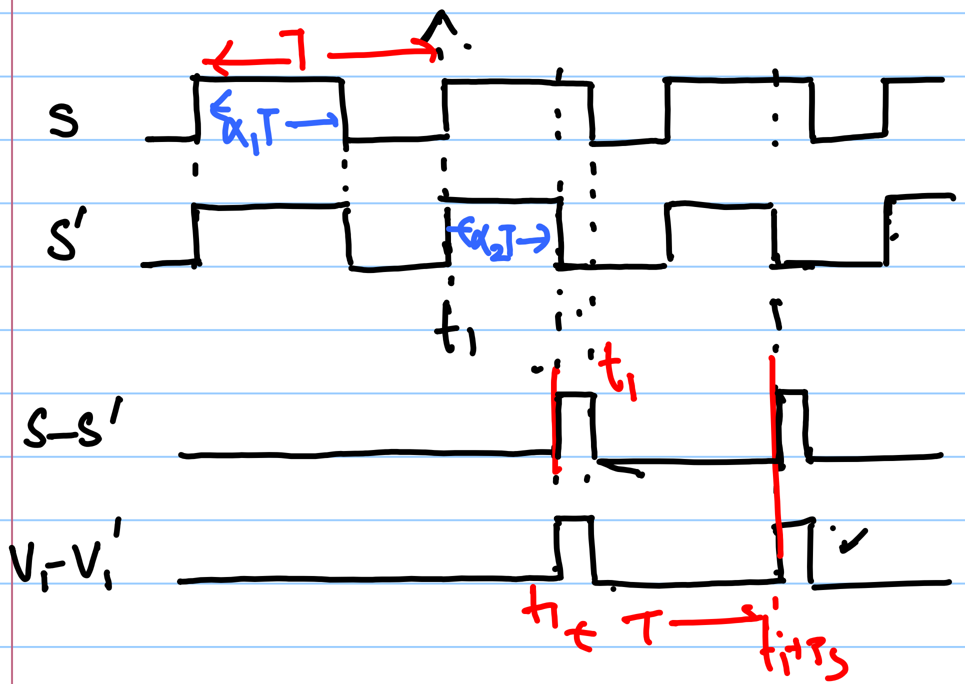
Lecture # 25



$V_1 = \Delta\alpha.$

$V_1 = \Delta\alpha V_s$

$f_s = \frac{1}{T} \Rightarrow \omega_s = \frac{2\pi}{T}$

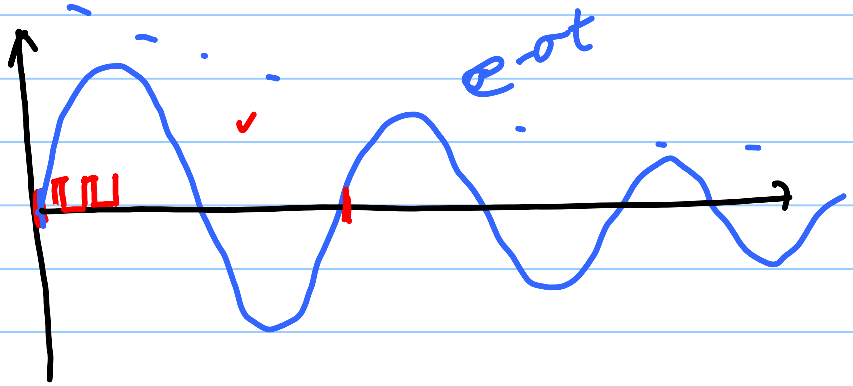


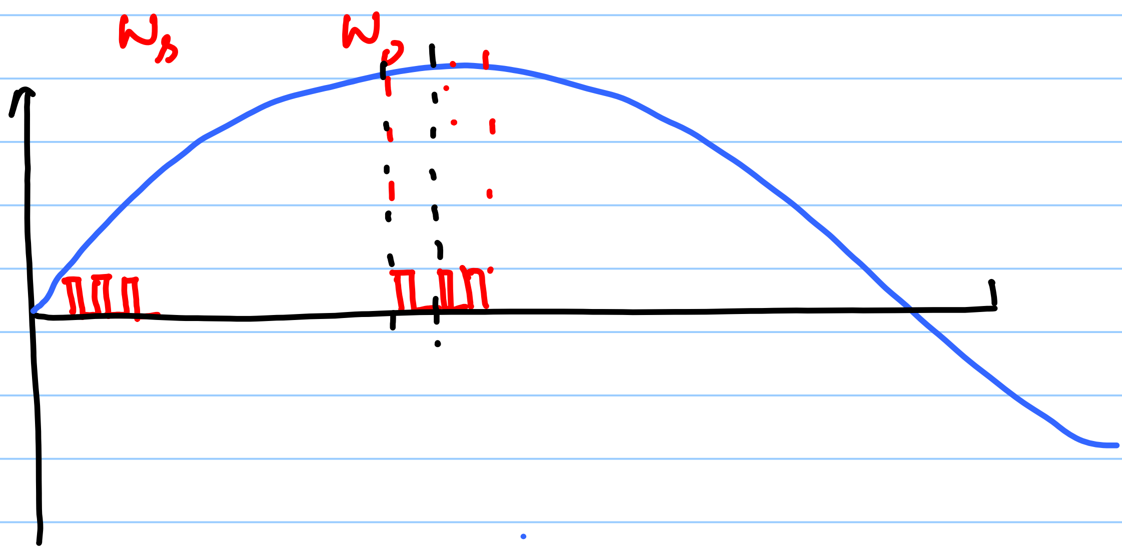
Pulse Width Modulated (PWM) waveform

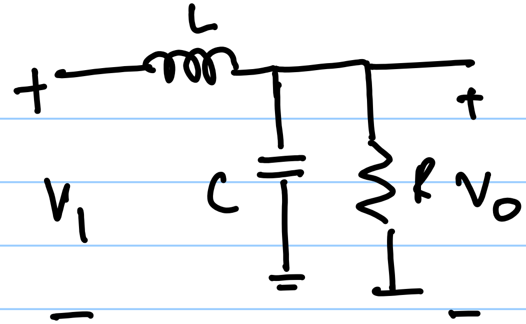
$V_1(t) - V_1'(t)$ is non zero for $t_1 \le t < t_1 + T_s$

$$\Delta V_o(t) = (V_1 - \hat{V}_1) * h(t)$$

$$= \int_0^t (V_i - V_1')(t-\tau)\, h(\tau)\, d\tau$$







$$\frac{V_o}{V_1} = H(s) \xrightarrow{\mathcal{L}^{-1}} h(t)$$

$$H(s) = \frac{\omega_p^2}{s^2 + s\frac{\omega_p}{Q_p} + \omega_p^2}$$

$$= \frac{\omega_p^2}{\left(s + \frac{\omega_p}{2Q_p}\right)^2 + \omega_p^2 - \frac{\omega_p^2}{4Q_p^2}}$$

$$= \frac{\omega_p^2}{(s+\sigma)^2 + \left(\omega_p\sqrt{1 - \frac{1}{4Q_p^2}}\right)^2}$$

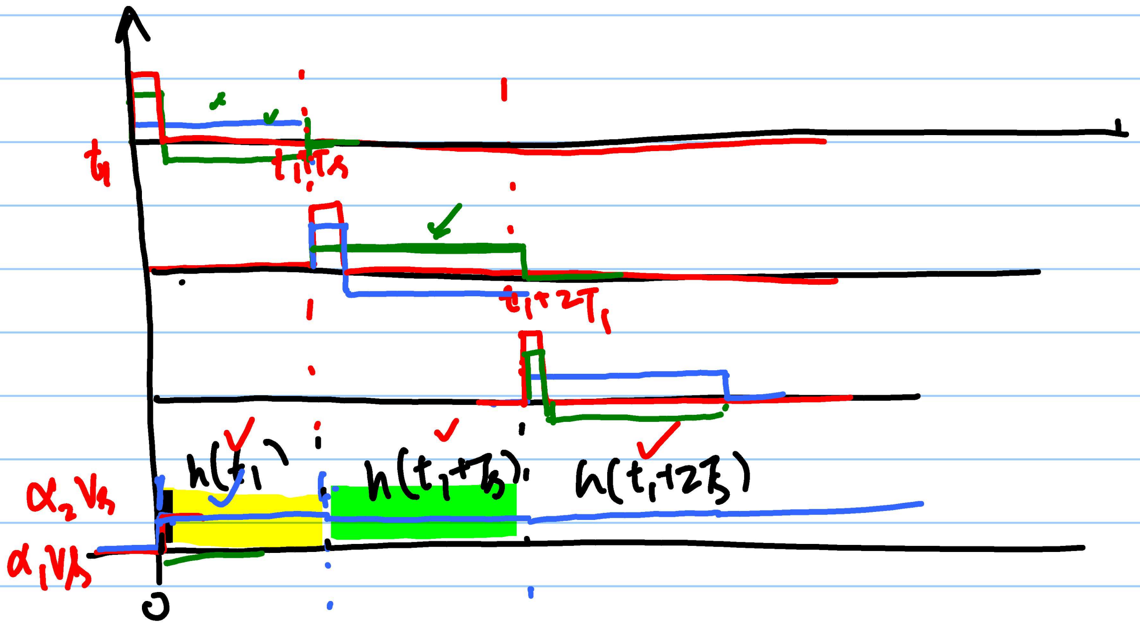
$$= \frac{\omega_p^2}{(s+\sigma)^2 + \omega_o^2}$$

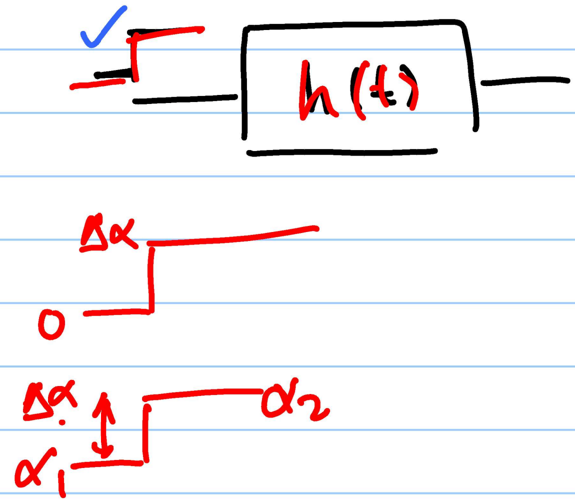
$$\Delta V_0(t) = \int_0^t (V_1 - \hat{V}_1)(\tau)\, h(t-\tau)\, d\tau$$

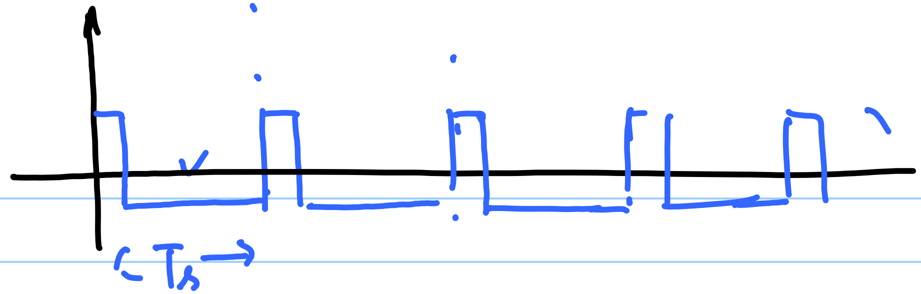
$$= \int_0^t (V_1 - \hat{V}_1)(t-\tau)\, h(\tau)\, d\tau$$

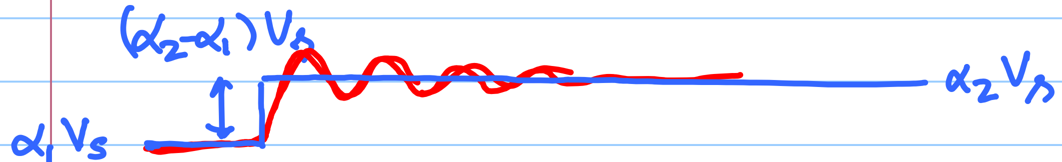
$$= \int_{t_1}^{t_1+T_s} (V_1 - \hat{V}_1)(t-\tau)\, h(\tau)\, d\tau + \int_{t_1+T_s}^{t_1+2T_s} (V_1 - \hat{V}_1)(t-\tau)\, h(\tau)\, d\tau + \ldots$$

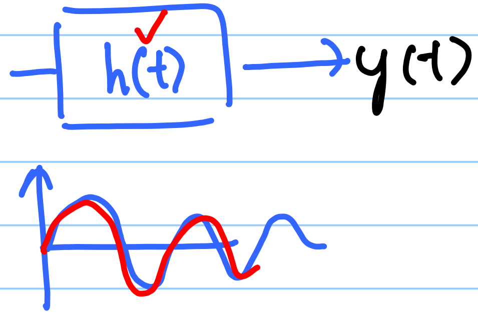
$$= h(t_1) \int_{t_1}^{t_1+T_s} (V_1 - \hat{V}_1)(t-\tau)\, d\tau + h(t_1+T_s) \int_{t_1+T_s}^{t_1+2T_s} (V_1 - \hat{V}_1)(t-\tau)\, d\tau + \ldots$$







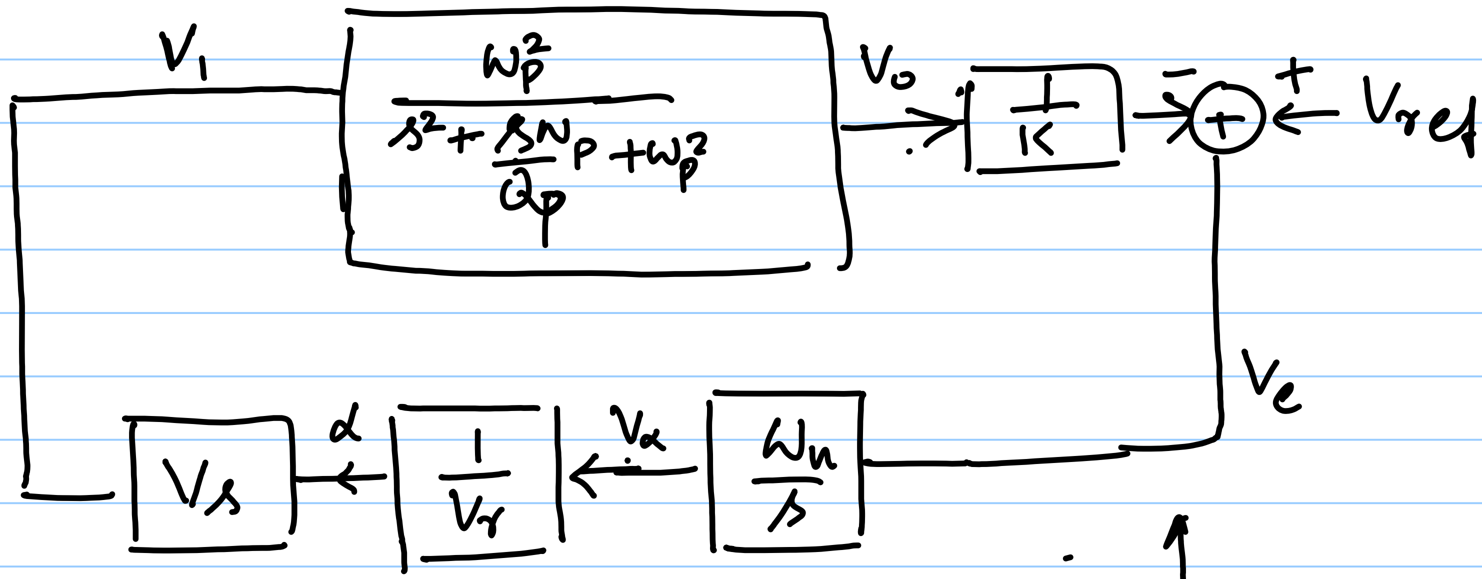




$$y(t) = \Delta\alpha \cdot u(t) * h(t)$$

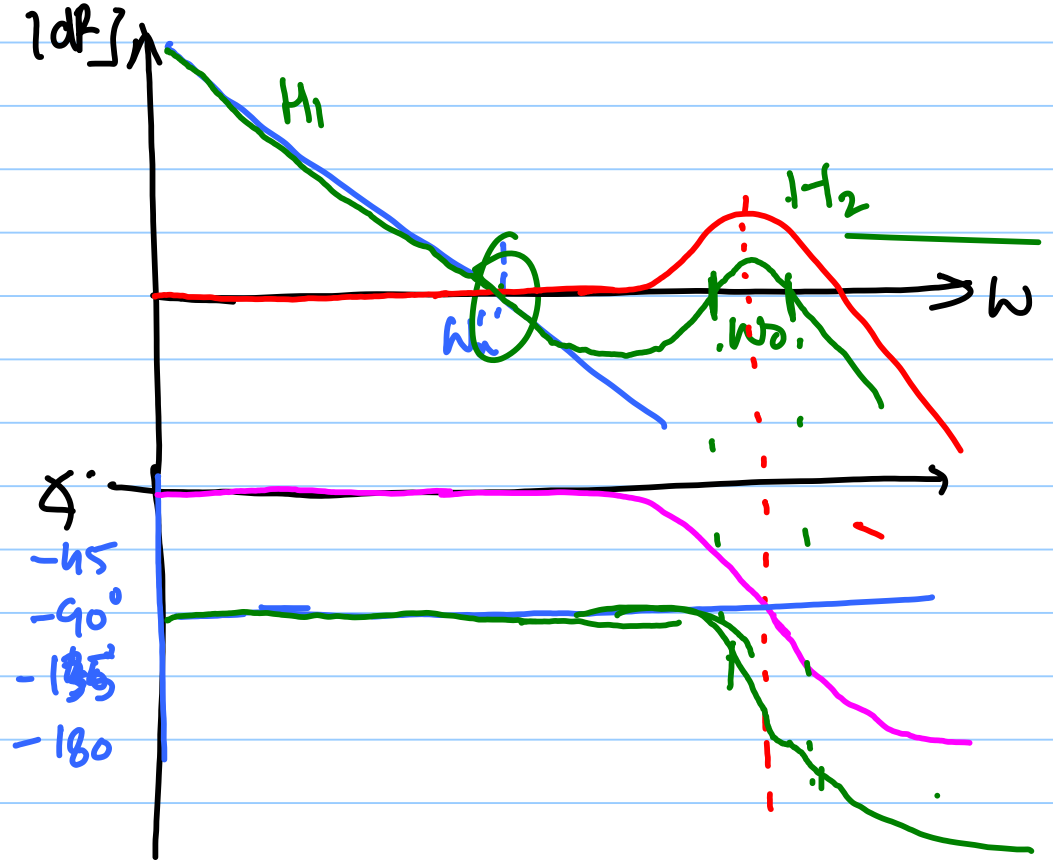
$$Y(s) = \frac{\Delta\alpha}{s} \times \frac{\omega_p^2}{(s+\sigma_p)^2+\omega_o^2} = \frac{\Delta\alpha}{s} \cdot \frac{\omega_p^2}{((s+\sigma_p)+j\omega_o)((s+\sigma_p)-j\omega_o)}$$

$$V_1(t-\tau) - \hat{V}_1(t-\tau) \equiv (V_1-\hat{V}_1)(t-\tau)$$



$$LG = \underbrace{\frac{\omega_p^2}{s^2 + \frac{s\omega_p}{Q_p^2} + \omega_p^2}}_{H_2} \cdot \underbrace{\times \frac{1}{K} \times \frac{\omega_n}{s} \times \frac{1}{V_r}}_{H_1} \cdot V_s$$

$20\log_{10}(|H_1|\cdot|H_2|)$



$$\omega_n' = \frac{\omega_n \cdot V_s}{k \cdot V_r}$$

$$\frac{\quad}{\{(s+\sigma)+j\omega_0\}\{(s+\sigma)-j\omega_0\}}$$