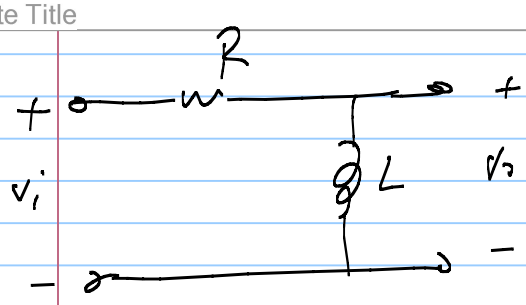
Note Title 4/9/2019



$\Rightarrow$

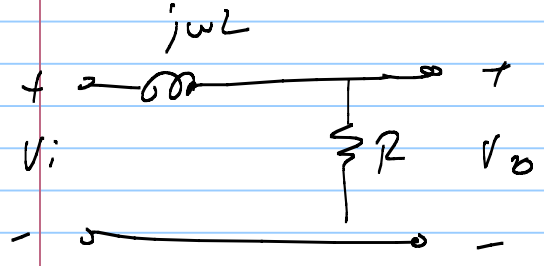


$$V_o = V_i \left(\frac{j\omega L}{R + j\omega L} \right)$$

$\omega = 0 \rightarrow V_o = 0$

$\omega \rightarrow \infty \rightarrow \frac{1}{\frac{R}{j\omega L} + 1} = 1 \Rightarrow V_o = V_i$

High-Pass filter

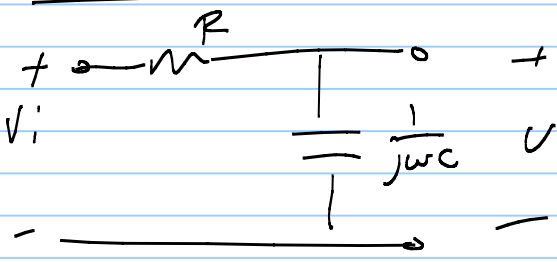


$$V_o = V_i \left(\frac{R}{R + j\omega L} \right)$$

$\omega = 0 \rightarrow V_o = V_i$

$\omega \rightarrow \infty \rightarrow V_o = 0$

$\Rightarrow$ Low-pass filter



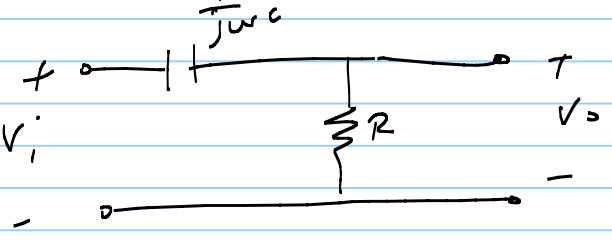
$$V_o = V_i \left(\frac{\frac{1}{j\omega C}}{R + \frac{1}{j\omega C}} \right)$$

$$= V_i \left(\frac{1}{1 + j\omega RC} \right)$$

$\omega = 0 \rightarrow V_o = V_i$

$\omega \rightarrow \infty \rightarrow V_o = 0$

$\Rightarrow$ Low-pass filter.

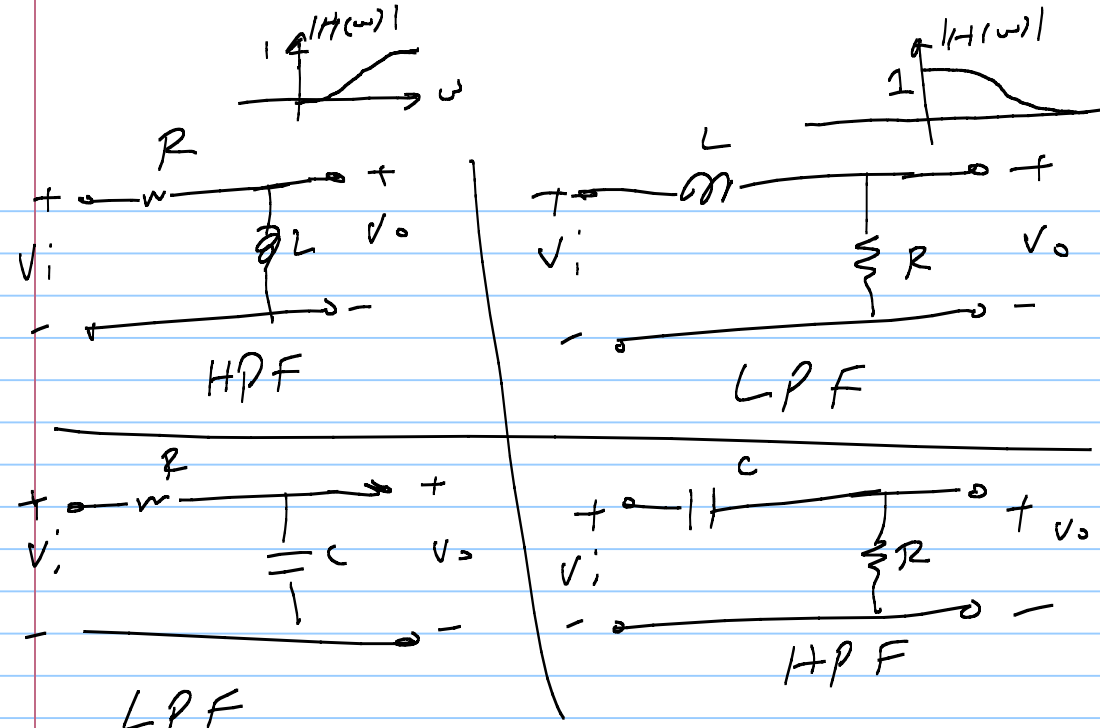


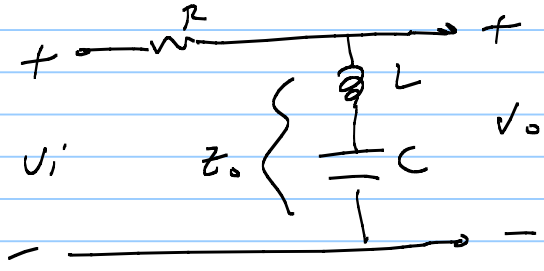
$$V_o = \frac{R}{R + \frac{1}{j\omega C}}$$

$\omega = 0 \rightarrow V_o = 0$

$\omega \rightarrow \infty \rightarrow V_o = V_i$

HPF





$$\omega_0 L = \frac{1}{\omega_0 C}$$

$$\omega_0^2 = \frac{1}{LC}$$

$$\omega_0 = \frac{1}{\sqrt{LC}}$$

$$Z_0 = j\omega L + \frac{1}{j\omega C} = j\omega L - j\frac{1}{\omega C}$$

$$L = \sqrt{L} \cdot \sqrt{L}$$

$$C = \sqrt{C} \cdot \sqrt{C}$$

$$\omega = \omega_0 \Rightarrow Z_0 = j\frac{L}{\sqrt{LC}} - j\frac{\sqrt{LC}}{C}$$

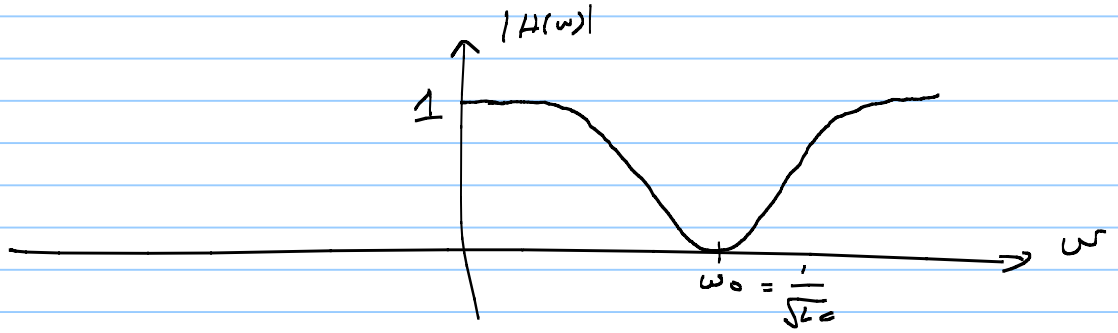
$$= j\sqrt{\frac{L}{C}} - j\sqrt{\frac{L}{C}} = 0$$

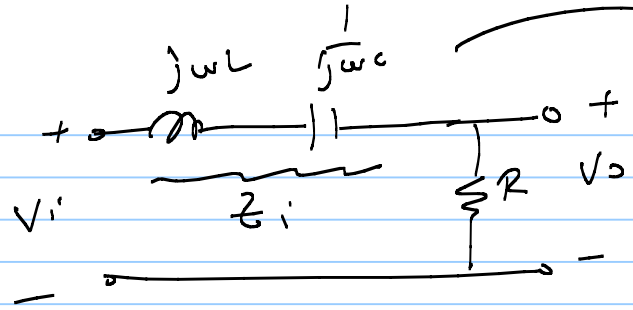
$\Rightarrow$ when $\omega = \omega_0 \rightarrow V_o = 0$

$\omega = 0 \rightarrow V_o = V_i$

$\omega \rightarrow \infty \rightarrow V_o = V_i$

} Band-stop filter





$$Z_i = j\omega L + \frac{1}{j\omega C}$$

$$= j\omega L - j\frac{1}{\omega C}$$

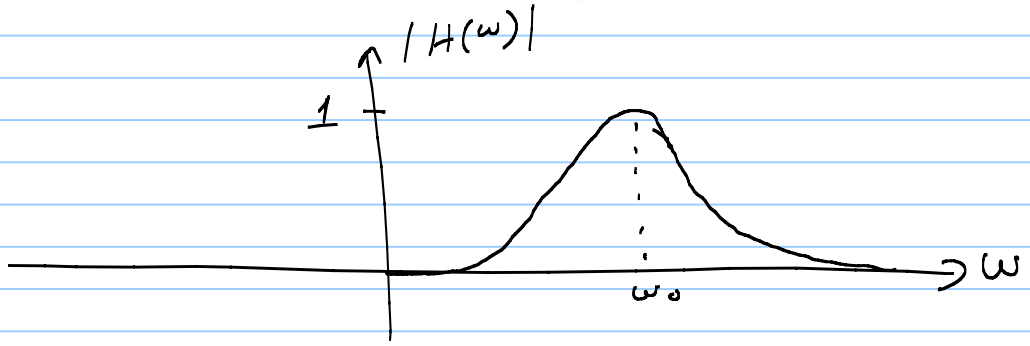
$$\omega = \omega_0 = \frac{1}{\sqrt{LC}}$$

$$Z_i = j\frac{L}{\sqrt{LC}} - j\frac{\sqrt{LC}}{C} = 0$$

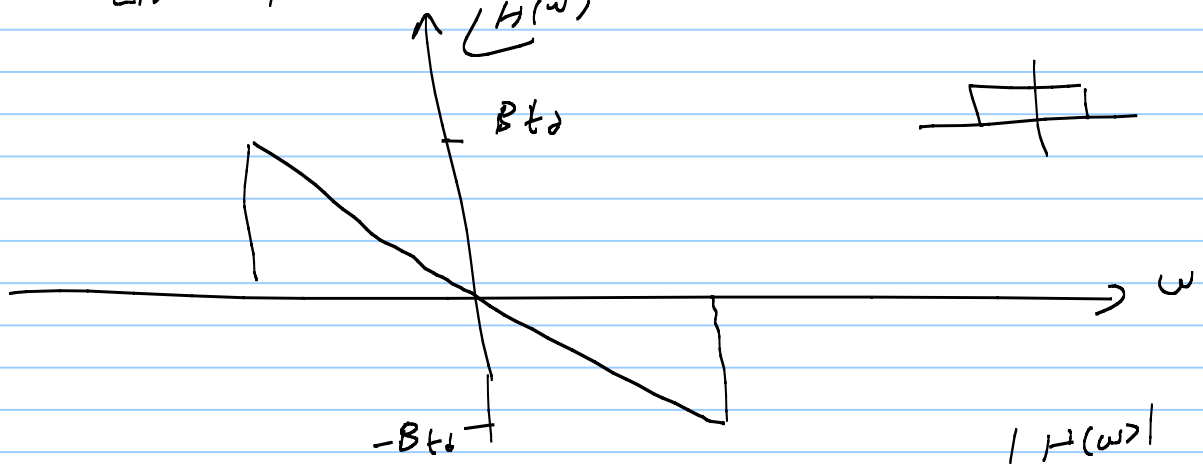
$\omega = 0 \rightarrow V_o = 0$

$\omega \rightarrow \infty \rightarrow V_o = 0$

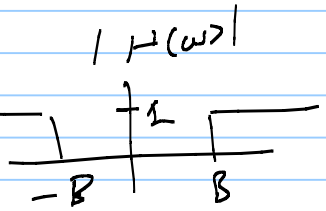
$\omega = \omega_0 \Rightarrow Z_i = 0 \Rightarrow V_o = V_i$

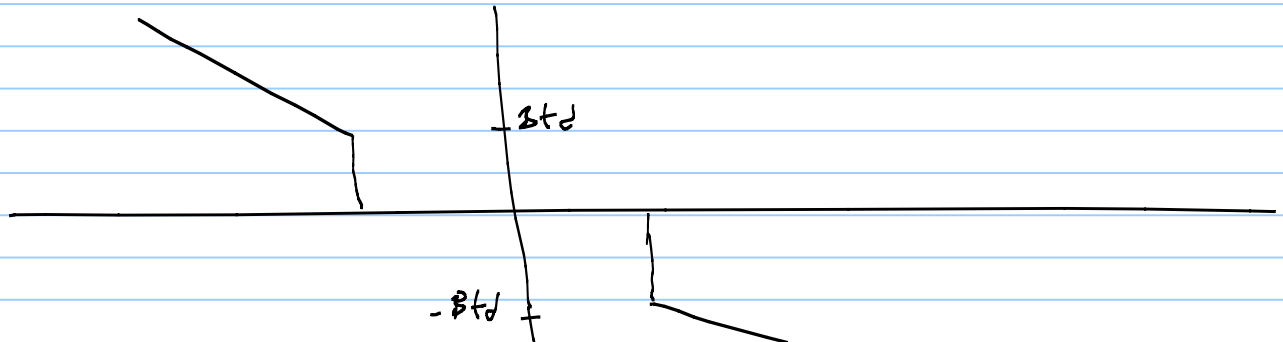


Linear-phase low-pass filter



Linear-phase High-pass filter







Linear-phase Band-stop

