Lecture 26
Figures
Figure 6-10: Examples of bandpass-filter responses.
Figure 6-12: Plots of $M_{HP}$ [dB] for $Q = 2$ (weak resonance) and $Q = 10$ (moderate resonance).
EE310 Lowpass Response

Figure 6-13: RLC lowpass filter.
Figure 6-14: Bandreject filter.
EE310 Band Reject Response

Figure 6-15: Comparison of magnitude responses of the first-order RC filter and the second-order RLC filter.

First-order filter

Second-order filter

Response of first-order filter

Response of second-order filter

$S_g = -20 \text{ dB/decade}$

$S_g = -40 \text{ dB/decade}$
**Table 6-2: Attributes of series and parallel RLC bandpass circuits.**

<table>
<thead>
<tr>
<th>RLC Circuit</th>
<th>Transfer Function</th>
<th>Resonant Frequency, $\omega_0$</th>
<th>Bandwidth, $B$</th>
<th>Quality Factor, $Q$</th>
<th>Lower Half-power Frequency, $\omega_{c1}$</th>
<th>Upper Half-power Frequency, $\omega_{c2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series</td>
<td>$H = \frac{V_R}{V_s}$</td>
<td>$\frac{1}{\sqrt{LC}}$</td>
<td>$\frac{R}{L}$</td>
<td>$\frac{\omega_0}{B} = \frac{\omega_0 L}{R}$</td>
<td>$\left[-\frac{1}{2Q} + \sqrt{1 + \frac{1}{4Q^2}}\right] \omega_0$</td>
<td>$\left[\frac{1}{2Q} + \sqrt{1 + \frac{1}{4Q^2}}\right] \omega_0$</td>
</tr>
<tr>
<td>Parallel</td>
<td>$H = \frac{I_s}{V_s}$</td>
<td>$\frac{1}{\sqrt{LC}}$</td>
<td>$\frac{1}{RC}$</td>
<td>$\frac{\omega_0}{B} = \frac{R}{\omega_0 L}$</td>
<td>$\left[-\frac{1}{2Q} + \sqrt{1 + \frac{1}{4Q^2}}\right] \omega_0$</td>
<td>$\left[\frac{1}{2Q} + \sqrt{1 + \frac{1}{4Q^2}}\right] \omega_0$</td>
</tr>
</tbody>
</table>

Notes: (1) The expression for $Q$ of the series RLC circuit is the inverse of that for $Q$ of the parallel circuit. (2) For $Q \geq 10$, $\omega_{c1} \approx \omega_0 - \frac{B}{2}$, $\omega_{c2} \approx \omega_0 + \frac{B}{2}$.