

E157 Lecture 5 Day Plan

Any questions before quiz

Quiz + Team Quiz + Talk through solution

Q roundup

- Bandpass fractional bandwidth = $1/Q$
- RLC ring down in step response \sim number of peaks to 5% = Q
- Series RLC $Q = \sqrt{L/C}/R$
- Parallel RLC $Q = R / \sqrt{L/C}$
- Series component $Q = X/R$
- Parallel component $Q = B/G$
- Compound Q from components \rightarrow draw schematic and do series-parallel

Practice ringing out in shunt – 50 ohm || 10pF || 100nH @1Grad/s – see below

Use <https://www.smithchart.net>

- Make some simple matching networks for eg: $1+1j$, vary frequency
- Show series / parallel equivalency

Check-in, office hours

You are designing a matching network for a 10pF capacitor in shunt with a 50 Ohm resistor driven by a 1Grad/s signal sent through a 50 Ohm transmission line.

$$B_n = \omega C / (1/Z_0) = Z_0 * \omega * C = 0.5$$

Need negative susceptance, so shunt L

$$B_n = 1/\omega L / (1/50) = 50/\omega L \rightarrow 100\text{nH}$$

$$Q = R / \sqrt{L/C} = 50/\sqrt{100\text{e-}9/10\text{e-}12} = 50/\sqrt{1\text{e}4} = 5$$

$$\sqrt{1/LC} = 1\text{Grad/s} \rightarrow L * 1\text{e-}11 = 1\text{e-}18 \rightarrow L=100\text{nH}$$