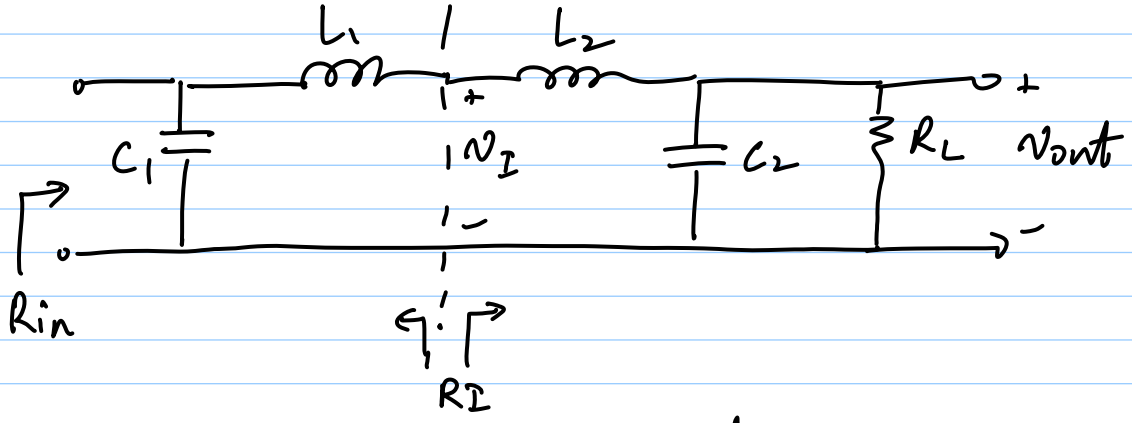
Q-relation in Π & T matches

Note Title 8/16/2011



$$Q = \omega_0 \cdot \frac{\text{Energy stored}}{\text{Avg. power loss}}$$

We want to prove the relation:

$$Q = Q_L + Q_R$$

R_I is the equivalent input impedance of the right-side L-match (L_2 - C_2)

Power is dissipated only in R_L

$$\therefore \frac{V_{out}^2}{R_L} = \frac{V_I^2}{R_I} \quad \text{——} (1)$$

current through L_1 & L_2 = $\frac{V_I}{R_I}$ —— (2)

from (1) & (2)

$$Q = \omega_0 \cdot \frac{\frac{1}{2}(L_1+L_2)\left(\frac{V_I}{R_I}\right)^2}{\frac{1}{2}\frac{V_{out}^2}{R_L}}$$

$$= \omega_0 \cdot (L_1+L_2) \cdot \frac{V_I^2/R_I^2}{V_I^2/R_I}$$

$$= \omega_0 \frac{(L_1+L_2)}{R_I} = Q_L + Q_R$$