From Table 6.1 for a parallel RLC circuit:

\[ \omega_0 = \frac{1}{\sqrt{LC}} = 2\pi f_0 \]

\[ \Rightarrow f_0 = \frac{1}{2\pi \sqrt{LC}} = \frac{1}{2\pi \sqrt{80 \times 10^9 \times 10 \times 10^{-12}}} = 355.9 \text{ MHz} \]

**Unloaded Q':**

\[ Q = \frac{\omega_0 RC}{2\pi f_0 RC} = \frac{2\pi \times 355.9 \text{ MHz} \times RC}{2.24 \times 10^9 \times 800 \times 10 \times 10^{-12}} = 17.92 \]

**Loaded Q' (QL):**

\[ Q_e = \frac{R_L}{\omega_0 L} = \frac{R_L}{R} \times Q = 40.3 \]

So

\[ R_L = \frac{1}{\frac{1}{Q_e} + \frac{1}{Q}} = 18.42 \]
\[ f_0 = 6 \text{ GHz} \]

\[
\beta = \frac{2\pi}{\lambda} = \frac{2\pi f}{c} = 125.7 \text{ m}^{-1} \text{ for air-filled line.}
\]

\[
\beta_l = 125.7 \times 0.03 = 3.77 \text{ radians}
\]

\[
\beta_l = 216^\circ
\]

\[
Z_{in} = jZ_0 \tan \beta_l = j(100) \tan(216^\circ) = j72.61 \text{ \Omega}
\]

To attain resonance, we must have

\[
Z_{in} = (j \chi_0)^* = \frac{j}{\omega C}
\]

So, we will get

\[
C = \frac{1}{\omega^2 Z_{in}} = 0.365 \text{ pF}
\]

So at 6 GHz frequency, the circuit with shunt resistor will be

\[
R = 10 \times 10^6 \Omega, \quad C = 0.365 \text{ pF}
\]

and

\[
L = \frac{Z_{in}}{\omega} = \frac{72.6}{2\pi \times 6 \times 10^9} = 1.93 \text{ nH}
\]

So

\[
R = \omega L C = 2\pi \times 6 \times 10^9 \times 10^6 \times 0.365 \times 10^{-12} = 138
\]