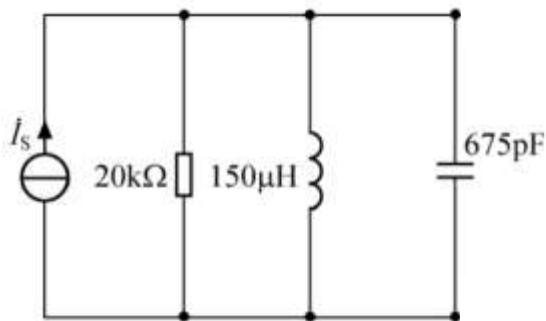




# 电路的频率特性

## 习题讲解

1. 并联谐振电路如题图所示。(1) 试求电路无载时的谐振频率 $f_0$ 、品质因数 $Q$ 及通频带 $BW$ ；(2) 若终接 $20\text{k}\Omega$ 的负载，重新计算整个电路的谐振频率、品质因数及通频带。



解：(1)  $f_0 = \frac{1}{2\pi\sqrt{LC}} = 500\text{kHz}$

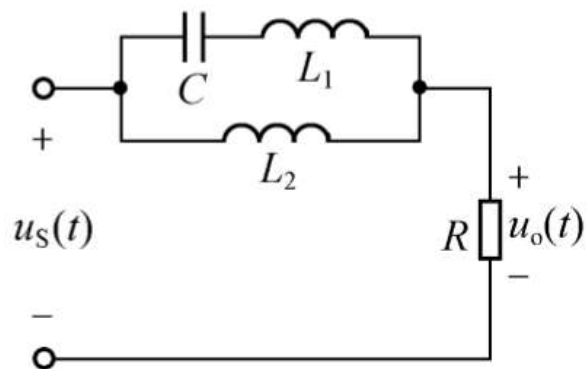
$Q = \frac{\omega_0 C}{G} = 42.4 \quad BW = \frac{f_0}{Q} = 11.79\text{kHz}$

(2)  $f'_0 = \frac{1}{2\pi\sqrt{LC}} = 500\text{kHz}$

$1\text{F} = 10^3 \text{mF} = 10^6 \mu\text{F} = 10^9 \text{nF} = 10^{12} \text{pF}$

$Q' = \frac{\omega_0 C}{G + G_L} = 21.2 \quad BW = \frac{f'_0}{Q'} = 23.58\text{kHz}$

2. 题图所示电路中, 已知  $u_s(t) = 10\cos 314t + 2\cos 3 \times 314t$  V,  $u_o(t) = 2\cos 3 \times 314t$  V,  $C = 9.4\mu\text{F}$ , 试求  $L_1$  和  $L_2$  的值。



分析:  $\omega_1 = 314\text{rad} \cdot \text{s}^{-1}$   $\omega_2 = 3 \times 314\text{rad} \cdot \text{s}^{-1}$   
这两个频率有什么特别?

$$\text{Im}(Z) = \text{Im}\left[\frac{(j\omega_2 L_1 + \frac{1}{j\omega_2 C}) \times j\omega_2 L_2}{(j\omega_2 L_1 + \frac{1}{j\omega_2 C}) + j\omega_2 L_2}\right] = 0$$

$$\text{Im}(Y) = \text{Im}\left[\frac{(j\omega_1 L_1 + \frac{1}{j\omega_1 C}) + j\omega_1 L_2}{(j\omega_1 L_1 + \frac{1}{j\omega_1 C}) \times j\omega_1 L_2}\right] = 0$$

$$\omega_1 = \frac{1}{\sqrt{(L_1 + L_2)C}}$$

$$\omega_2 = \frac{1}{\sqrt{L_1 C}}$$

$$L_1 = 0.12\text{H} \quad L_2 = 0.96\text{H}$$

THE END