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2.4 PARALLEL RESONANT "TRANSFORMERLESS" NETWORKS 41

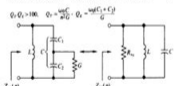


Fig. 2.4.3 Parallel circuits with equivalent input impedances

and in turn

$$Z_{L,R} = \frac{1}{\frac{1}{Z_C} + \frac{1}{Z_L + Z_{C_2}} + \frac{1}{Z_{C_3}}} \quad (2.4.9)$$

where

$$G_m = \omega^2 C_1 \left( 1 + \frac{1}{\omega^2 Q_1^2} \right)$$

Equation (2.4.9) represents the input impedance of the equivalent RLC circuit shown in Fig. 2.4.3. If  $Q_1 \gg 1$  and, in addition,  $\omega^2 Q_1^2 \gg 1$ , then  $G_m$  reduces to the simplified form

$$G_m = \omega^2 C_1 \quad \omega^2 Q_1^2 \gg 1 \quad (2.4.10)$$

In particular, if  $\omega^2 Q_1^2 \gg 20$ , then  $G_m = \omega^2 C_1$  within 5%, whereas if  $\omega^2 Q_1^2 > 100$ , then  $G_m = \omega^2 C_1$  within 1%. Note that since  $\omega < 1$ ,  $\omega^2 Q_1^2 > 100$  ensures  $Q_1 Q_2 > 100$ . With this additional condition satisfied, we may transform the equivalent circuit shown in Fig. 2.4.3 into an alternative and more useful form, shown in Fig. 2.4.4. Clearly, if  $G$  is reflected through the ideal transformer to obtain

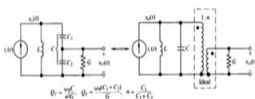


Fig. 2.4.4 Transformer model for resonant circuit with tapped and banded capacitors

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