**19.3** Dual of the series resonant converter. In the converter illustrated in Fig. 19.54, $L_{F1}$, $L_{F2}$, and $C_F$ are large filter elements, whose switching ripples are small. $L$ and $C$ are tank elements, whose waveforms $i_L(t)$ and $v_C(t)$ are nearly sinusoidal.

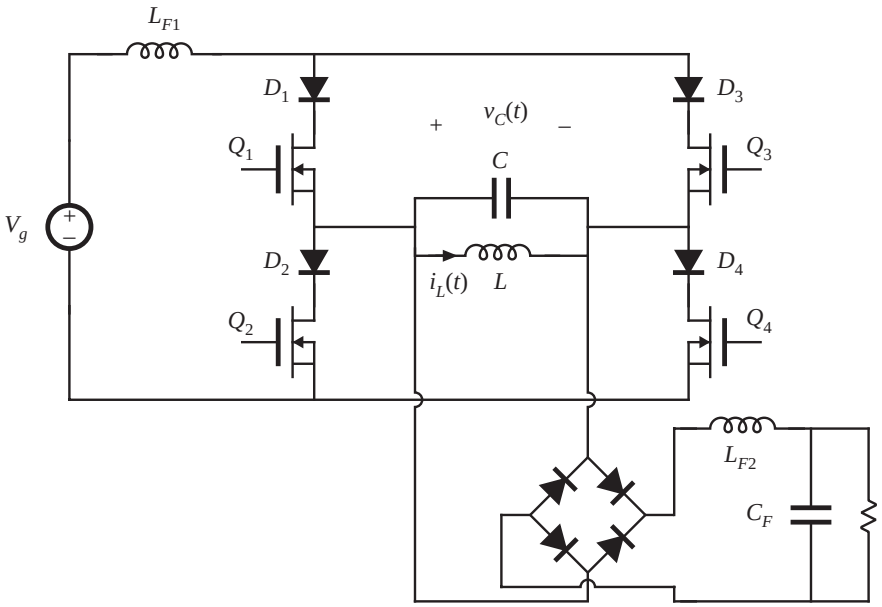


**Fig. 19.54** Dual of the series resonant converter, Problem 19.3.

**(a)** Using the sinusoidal approximation method, develop equivalent circuit models for the switch network, tank network, and rectifier network.

**(b)** Sketch a Bode diagram of the parallel $LC$ parallel tank impedance.

**(c)** Solve your model. Find an analytical solution for the converter voltage conversion ratio $M = V/V_g$, as a function of the effective $Q_e$ and the normalized switching frequency $F = f_s/f_0$. Sketch $M$ vs. $F$.

**(d)** What can you say about the validity of the sinusoidal approximation for this converter? Which parts of your $M$ vs. $F$ plot of part (c) are valid and accurate?