6.334 Power Electronics
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Problem 8.1  KSV Problem 9.5

Problem 8.2

Consider the system with matching network shown in Fig. 1.

(a) Select L and C such that the input impedance $Z_{in}$ is 50 Ohms resistive at the Industrial, Scientific, and Medical (ISM) band frequency of 27.12 MHz.

(b) Find the efficiency of the matching network, assuming that it operates with purely sinusoidal waveforms. For this calculation, please assume that the inductor quality factor $Q_L = 100$ at the operating frequency, and that the capacitor quality factor is sufficiently high that capacitor loss is negligible. (*Note: Recall that inductor quality factor $Q = \omega L/R$, where $R$ is the equivalent series resistance of the inductor.*)

![Matching Network Diagram](attachment:image.png)

**Figure 1** A matching network with a resistive load of 75 Ohms.

Problem 8.3

Consider the full-bridge resonant converter of KSV Fig. 9.19(a). Assuming the rectified output voltage is constant at a voltage $V_R$, please find an equivalent ac-side resistance for the bridge rectifier $R_{eq}$ as a function of $V_R$ and the ac current magnitude $I_A$. This can be done with a *describing function approach*, in which one only considers the fundamental ac component of voltage $v_r'$. Demonstrate that this expression for resistance correctly models power transfer from the dc sources to the rectifier, under the assumption that the inductor current is a pure sinusoid.