A group of small appliances on a 60 Hz system requires 20 kVA at 0.85 pf lagging when operated at 125 V (rms). The impedance of the feeder supplying the appliances is $0.01 + j0.08 \, \Omega$. The voltage at the load end of the feeder is 125 V (rms).

1. What is the rms magnitude of the voltage at the source end of the feeder?
2. What is the average power loss in the feeder?
3. What size capacitor (in microfarads) at the load end of the feeder is needed to improve the load power factor to unity?
4. After the capacitor is installed, what is the rms magnitude of the voltage at the source end of the feeder if the load voltage is maintained at 125 V (rms)?
5. What is the average power loss in the feeder for (d)?

The load impedance $Z_L$ for the circuit shown in Fig. P10.36 is adjusted until maximum average power is delivered to $Z_L$.

1. Find the maximum average power delivered to $Z_L$.
2. What percentage of the total power developed in the circuit is delivered to $Z_L$?