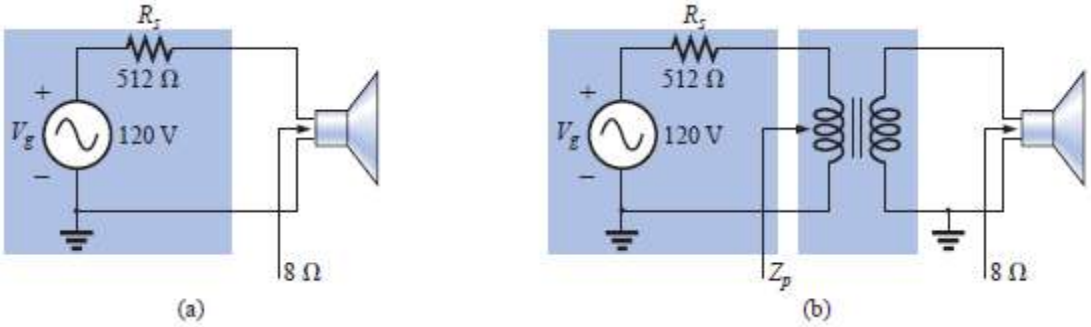
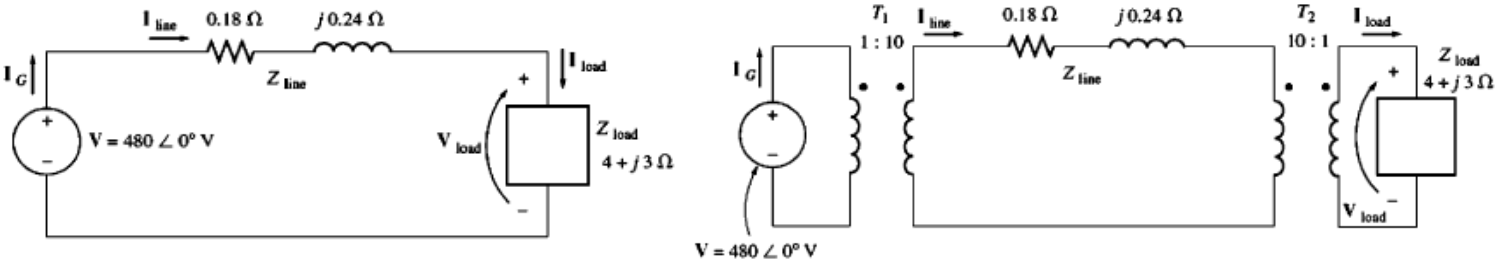
Mathematical Problems

1. The source impedance in the following figure is 512 Ω, while the input impedance of the speaker is 8-Ω.
   a) Determine the power delivered to the speaker.
   b) Determine the turns–ratio of the audio impedance matching transformer introduced between the speaker and the source to ensure maximum power transfer. Determine the power delivered to the speaker.
   c) Compare the power delivered to the speaker under the conditions of parts (a) and (b).



2. A single-phase power system consists of a 480-V, 60-Hz generator supplying a load Z_{load} = 4 + j3 Ω through a transmission line of impedance Z_{line} = 0.18 + *j0.24* Ω. Answer the following questions about this system.
   a) If the power system is exactly as shown in fig (a), what will the voltage at the load be? What will the transmission line losses be?
   b) Suppose a 1:10 step-up transformer is placed at the generator end (sending end) of the transmission line and a 10:1 step-down transformer is placed at the load end (receiving end) of the line as shown in fig (b). What will the load voltage be now? What will the transmission line losses be now?



3. A 100 kVA, 60 Hz, 7200-480V, single phase, step-down transformer has the following parameters in ohms:

R_p=3.06	R_s=0.014	X_m =17809
X_p=6.05	X_s=0.027	R_{fe} =71400

The transformer is supplying a load that draws rated current at 480V and 75 percent lagging power factor. Determine

   a) Equivalent resistance and equivalent reactance referred to the secondary side
   b) Input voltage at the primary side
   c) Voltage Regulation and Efficiency