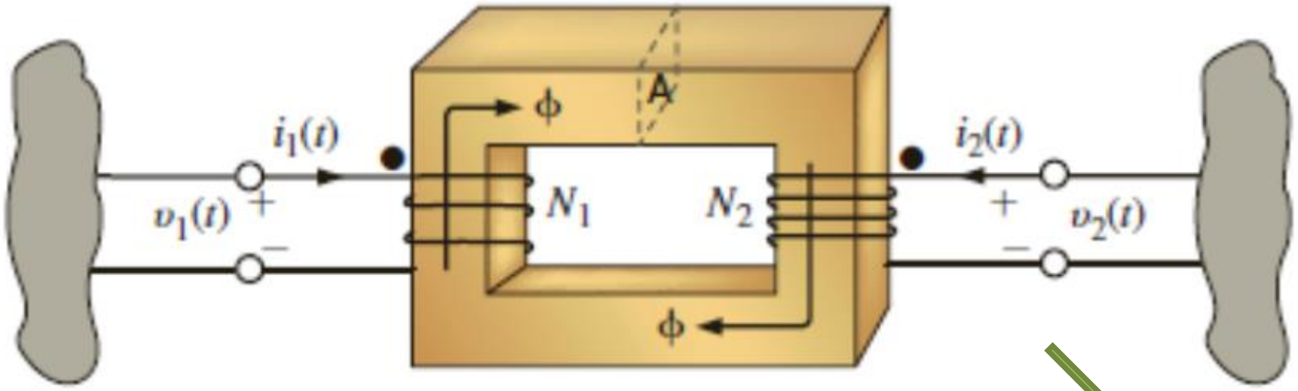
Last Lecture → IdealTransformer



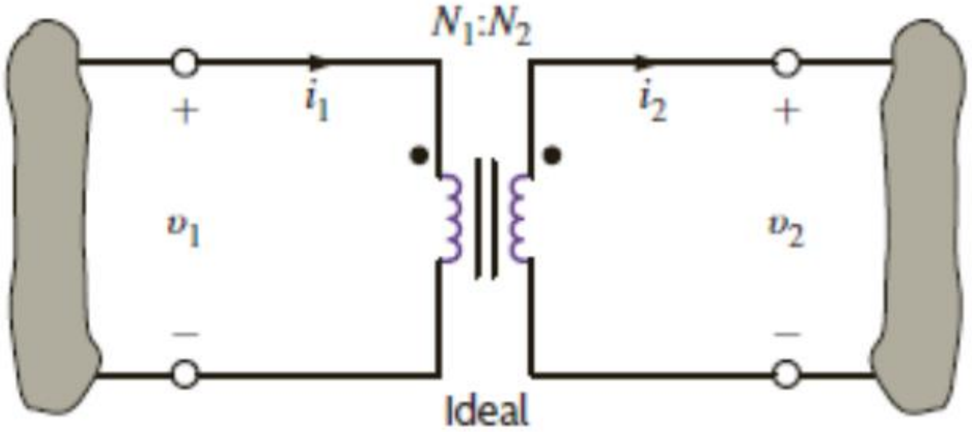
$$\lambda_1 = N_1 \cdot \phi \qquad \lambda_2 = N_2 \cdot \phi$$

$$v_1 = \frac{d\lambda_1}{dt} = N_1 \frac{d\phi}{dt} \qquad v_2 = \frac{d\lambda_2}{dt} = N_2 \frac{d\phi}{dt}$$

$$\therefore \frac{v_2}{v_1} = \frac{N_2}{N_1}$$

Assuming an ideal magnetic core with infinite permeability…

$$\left.\begin{aligned} P_1 + P_2 &= 0 \\ v_1 \cdot i_1 + v_1 \cdot \frac{N_2}{N_1} \cdot i_2 &= 0 \end{aligned}\right\} \therefore \frac{i_2}{i_1} = -\frac{N_1}{N_2}$$



$$\frac{v_2}{v_1} = \frac{N_2}{N_1} \qquad \frac{i_2}{i_1} = \frac{N_1}{N_2}$$

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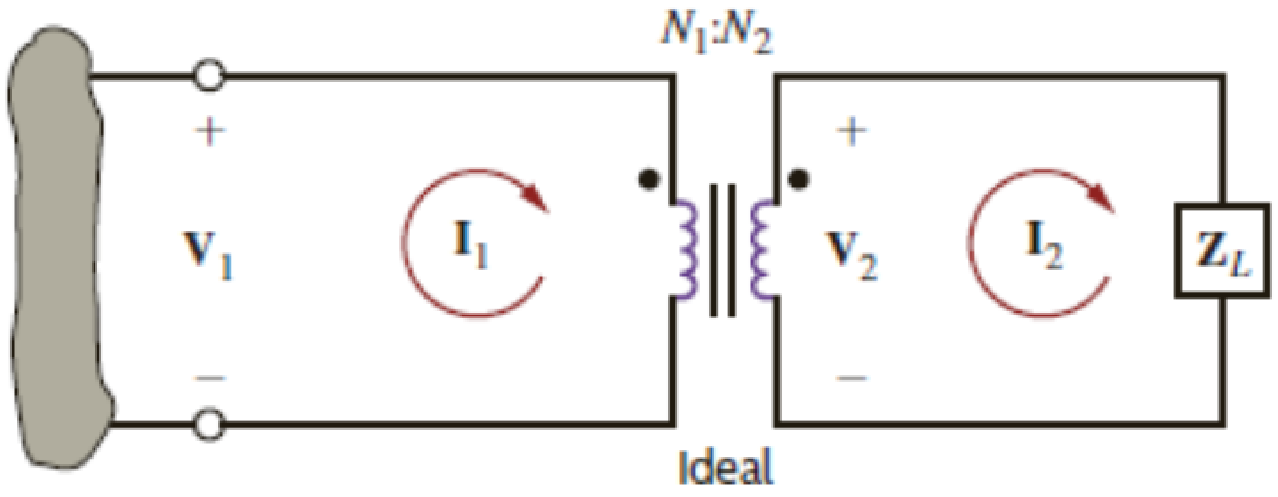


$$\frac{N_2}{N_1} = n \rightarrow V_2 = \frac{N_2}{N_1} V_1 = n \cdot V_1$$

$$I_2 = \frac{N_1}{N_2} I_1 = \frac{1}{n} \cdot I_1$$

$$Z_L = \frac{V_2}{I_2}$$

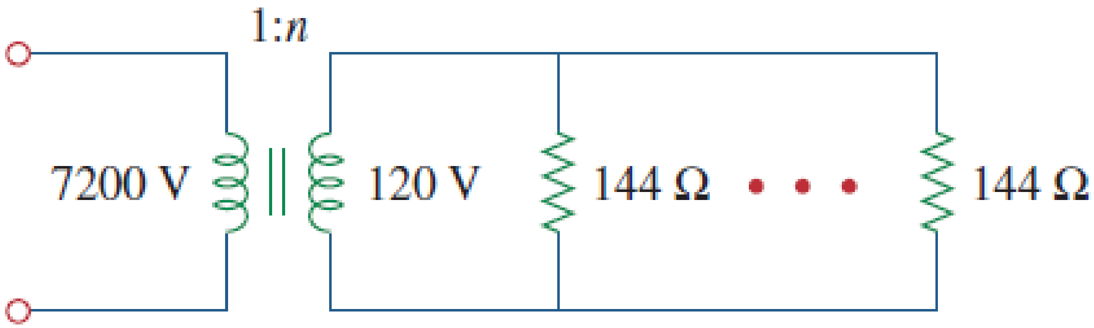
$$Z_1 = \frac{V_1}{I_1} = \frac{1}{n^2} Z_L$$

- *If both voltages are referenced positive at the dotted terminals or un-dotted terminals, then $V_2/V_1=N_2/N_1$. If this is not true, then $V_2/V_1=-N_2/N_1$.*
- *If both currents are defined as entering at dotted terminals or un-dotted terminals, then $I_2/I_1=-N_1/N_2$. If this is not true, then $I_2/I_1=N_1/N_2$.*

Problem

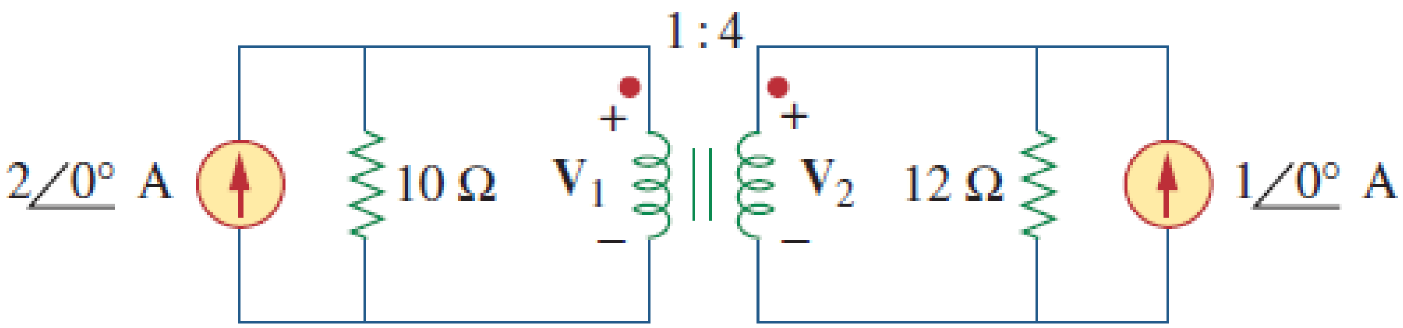
Ten bulbs in parallel are supplied by a 7,200/120 V transformer as shown, where the bulbs are modeled by the 144 Ω resistors. Find:

a) **the turns ratio n,**
b) **the current through the primary winding.**



Problem

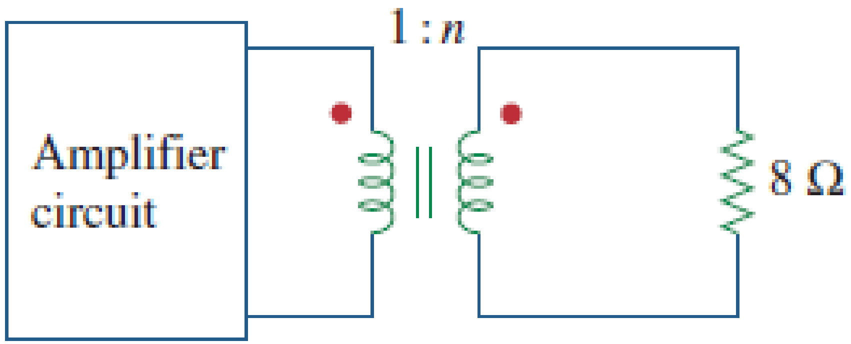
Obtain V_1 and V_2 in the ideal transformer circuit provided.



Problem

A transformer is used to match an amplifier with an 8Ω load as shown in the figure provided. The Thevenin equivalent of the amplifier is: V_{th} = 10V, Z_{th} = 128Ω.

a) **Find the required turns ratio n for maximum energy power transfer**
b) **Determine the primary and secondary currents**
c) **Determine the primary and secondary voltages**



Problem

Find the Thevenin equivalent for the circuit provided at terminals a-b.