

Chapter 37 Electromagnetic Induction

Transformers

A transformer has 50 turns on its primary coil and 500 turns on its secondary coil. If the input current is 1.4 A, what is the output current?

1. Read and Understand

What information are you given?

Number of turns on the primary coil = $N_p = 50$

Number of turns on the secondary coil = $N_s = 500$

Input current = $I_p = 1.4$ A

2. Plan and Solve

What unknown are you trying to calculate?

Output current = $I_s = ?$

You can relate the voltage and number of turns on each coil.

$$\frac{V_p}{N_p} = \frac{V_s}{N_s}$$

You can also relate the voltage and current of each coil.

$$V_p \times I_p = V_s \times I_s$$

Combining these, you can relate the current and the number of turns on each coil.

$$\frac{N_p}{N_s} = \frac{I_s}{I_p}$$

Solve for the unknown.

$$I_s = I_p \frac{N_p}{N_s}$$

Substitute known values in for each variable.

$$I_s = 1.4 \text{ A} \left(\frac{50}{500} \right) = 0.14 \text{ A}$$

3. Look Back and Check

Is your answer reasonable?

The ratio of current in the two coils of a transformer is inversely proportional to the ratio of number of turns. Because the number of turns increases by a factor of 10, the current should decrease by a factor of 10, which it does, so the answer is reasonable.

Math Practice

On a separate sheet of paper, solve the following problems.

1. A transformer has 300 turns on its primary coil and 60 turns on its secondary coil. If the input current is 0.8 A, what is the output current?

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2. A transformer has 400 turns on its primary coil and 20 turns on its secondary coil. If the primary voltage is 120 V, what is the secondary voltage?
3. A transformer has 70 turns on its primary coil and 14 turns on its secondary coil. If the input current is 2.8 A, what is the output current?