Concept Question 8-3: What does rms stand for and how does it relate to its definition?

$$P_{\text{av}} = \frac{1}{T}\int_0^T p(t)\,dt = \frac{1}{T}\int_0^T i^2(t)\,R\,dt. \qquad (8.11)$$

▶ We would like to introduce a new attribute of $i(t)$, called its *effective value*, I_{eff}, defined such that the average power P_{av} delivered by $i(t)$ to resistor R is equivalent to what a dc current I_{eff} would deliver to R, namely $I_{\text{eff}}^2 R$. ◀

That is,

$$I_{\text{eff}}^2 R = P_{\text{av}} = \frac{1}{T}\int_0^T i^2(t)\,R\,dt. \qquad (8.12)$$

Solving for I_{eff} gives

$$I_{\text{eff}} = \sqrt{\frac{1}{T}\int_0^T i^2(t)\,dt} \qquad (8.13)$$

According to Eq. (8.13), I_{eff} is obtained by taking the square *root* of the *mean* (average value) of the *square* of $i(t)$. The three terms characterizing the operation are coupled together to form *root-mean-square* (*rms* for short) and I_{eff} is relabeled I_{rms}.