

Mastering Physics Solutions Chapter 24

Alternating Current Circuits

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Chapter 24 Alternating Current Circuits Q.1CQ

How can the rms voltage of an ac circuit be nonzero when its average value is zero? Explain.

Solution:

For a complete cycle the voltage oscillates between positive and negative symmetrically.

Therefore the sum of symmetric positive and negative values will become zero and therefore the average value of ac - voltage is zero for a complete cycle.

But when we calculate the rms value of ac - voltage we first calculate the square of the voltage. Therefore whether the voltage is positive or negative its square is a positive. Therefore the rms voltage of ac is always non zero.

Chapter 24 Alternating Current Circuits Q.1P

An ac generator produces a peak voltage of 55 V. What is the rms voltage of this generator?

Solution:

The peak voltage of ac generator $V_{\max} = 55\text{V}$

But rms voltage of ac is given by $V_{\text{rms}} = \frac{V_{\max}}{\sqrt{2}}$

$$\therefore V_{\text{rms}} = \frac{55\text{V}}{\sqrt{2}}$$

$$= \frac{55}{1.414}\text{V}$$

$$\boxed{V_{\text{rms}} = 39\text{V}}$$