

**Answer on Question #45749 – Physics, Electric Circuits**

*A voltmeter connected across a 60Hz ac source reads 240V. Write down the expression of the instantaneous voltage as a function of time.*

AC voltage could be expressed by sinusoidal wave equation:

$$V = V_{peak} \sin(2\pi\nu t)$$

Where  $V_{peak}$  – is an amplitude value of a voltage,  $\nu$  – is voltage frequency.

For the AC voltmeter will show RMS voltage:

$$V_{rms} = \frac{V_{peak}}{\sqrt{2}}$$

Thus,

$$V_{peak} = V_{rms}\sqrt{2} = 240V \cdot \sqrt{2} \approx 339.4V$$

So, expression of the instantaneous voltage as a function of time:

$$V = 339.4 \sin(2 \cdot 3.14 \cdot 60\text{Hz} \cdot t)$$

$$V = 339.4 \sin(377t)$$

**Answer:** instantaneous voltage as a function of time:

$$\mathbf{V = 339.4 \sin(377t)}$$