

Answer on Question #40902, Physics, Electric Circuits

The potential difference V and the current i flowing through an instrument in an ac circuit of frequency f are given by $V = 5 \cos \omega t$ volts and $I = 2 \sin \omega t$ amperes (where $\omega = 2\pi f$). The power dissipated in the instrument is (1) Zero (2) 10 W (3) 5 W (4) 2.5 W

Solution

The potential difference V

$$V = 5 \cos \omega t = 5 \sin \left(\omega t + \frac{\pi}{2} \right).$$

Power

$$P = V_{rms} I_{rms} \cos \varphi,$$

where rms means the root mean square, $\cos \varphi$ - the power factor.

Since

$$\varphi = \frac{\pi}{2}.$$

therefore

$$\cos \varphi = \cos \frac{\pi}{2} = 0.$$

The power dissipated in the instrument is

$$P = V_{rms} I_{rms} \cdot 0 = 0.$$

Answer: (1) Zero.