

Solutions

Each answer shows the steps, then the **result**.

2.1

- **peak value** — the maximum value in a cycle
- **period** — the time for one complete cycle

2.2

- $I_{\text{r.m.s.}} = I_0/\sqrt{2}$

$$I_{\text{r.m.s.}} = \frac{5.0 \text{ A}}{\sqrt{2}} = \mathbf{3.5 \text{ A}}$$

2.3

- $V_{\text{r.m.s.}} = V_0/\sqrt{2}$

2.4

- $T = 1/f = 1/(50 \text{ Hz}) = \mathbf{0.020 \text{ s}}$

2.5

- peak $V_0 = 18 \text{ V}$
- $\omega = 40\pi \text{ rad s}^{-1}$ ($\approx 126 \text{ rad s}^{-1}$)

3.1 C

- $I_{\text{r.m.s.}} = I_0/\sqrt{2}$

3.2

- (a) $V_{\text{r.m.s.}} = V_0/\sqrt{2}$

$$V_{\text{r.m.s.}} = \frac{340 \text{ V}}{\sqrt{2}} = \mathbf{240 \text{ V}}$$

- (b) $P = V_{\text{r.m.s.}}^2/R$

$$P = \frac{(240 \text{ V})^2}{100 \Omega} = \mathbf{576 \text{ W}}$$

3.3

- the power $P = I^2 R$ varies as $\sin^2$, whose **average over a cycle** is $\frac{1}{2}$
- so the mean power is half the peak power $I_0^2 R$

3.4

- $\omega = 2\pi/T$

$$\omega = \frac{2\pi}{0.020 \text{ s}} = \mathbf{3.1 \times 10^2 \text{ rad s}^{-1}}$$

3.5

- (a) $\omega = 100\pi \text{ rad s}^{-1}$

$$T = \frac{2\pi}{\omega} = \frac{2\pi}{100\pi \text{ rad s}^{-1}} = \mathbf{0.020 \text{ s}}$$

- (b) $V_{\text{r.m.s.}} = 340 \text{ V}/\sqrt{2} = 240 \text{ V}$

$$\langle P \rangle = \frac{V_{\text{r.m.s.}}^2}{R} = \frac{(240 \text{ V})^2}{60 \Omega} = \mathbf{9.6 \times 10^2 \text{ W}}$$