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

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

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