

- 10 (a) By reference to heating effect, explain what is meant by the *root-mean-square (r.m.s.)* value of an alternating current.

.....  
.....  
..... [2]

- (b) The variations with time  $t$  of two currents  $I_1$  and  $I_2$  are shown in Fig. 10.1 and Fig. 10.2.

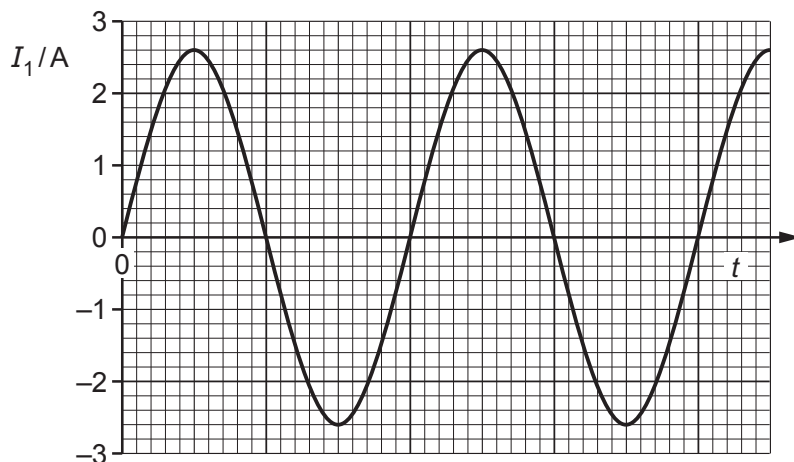


Fig. 10.1

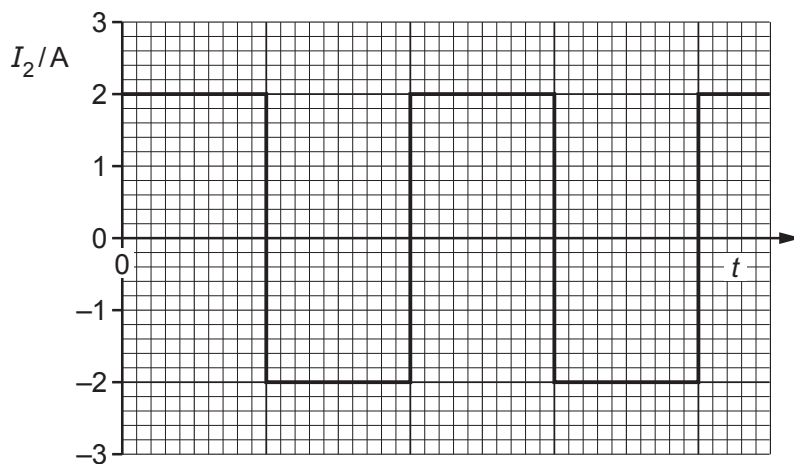


Fig. 10.2

- (i) Use Fig. 10.1 to determine the peak value and the r.m.s. value of the current  $I_1$ .

peak value = ..... A

r.m.s. value = ..... A  
[1]

- (ii) Use Fig. 10.2 to determine the peak value and the r.m.s. value of the current  $I_2$ .

peak value = ..... A

r.m.s. value = ..... A  
[1]

- (c) The variation with time  $t$  of the supply voltage  $V$  to a house is given by the expression

$$V = 240 \sin kt$$

where  $V$  is in volts,  $t$  is in seconds and  $k$  is a constant with unit  $\text{rad s}^{-1}$ .

- (i) The frequency of the supply voltage is 50 Hz.

Determine  $k$  to two significant figures.

$k = \dots \text{ rad s}^{-1}$  [2]

- (ii) The supply voltage is applied to a heater. The mean power of the heater is 3.2 kW.

Calculate the resistance of the heater.

resistance = .....  $\Omega$  [2]