3 An alternating supply of frequency 50 Hz and having an output of 6.0 V r.m.s. is to be rectified so as to provide direct current for a resistor R. The circuit of Fig. 3.1 is used.

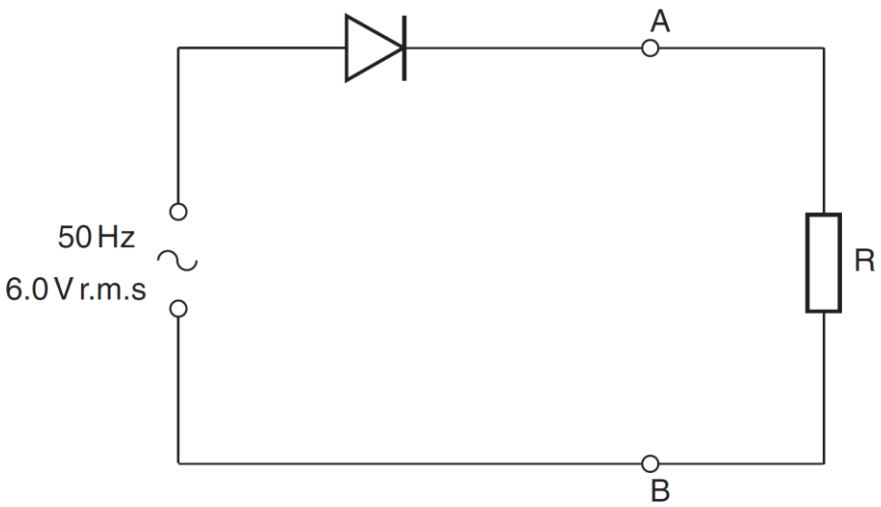


Fig. 3.1

The diode is ideal.

The output potential difference V of the alternating power supply is represented by

$$V = V_o \sin(kt)$$

where V_o is the maximum potential difference in volts and t is the time in seconds.

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

……

……

……[1]

(b) Determine the value of V_o

V_o = …… V [1]

(c) Determine the value and unit of k.

value of k = ……..…… unit ……..…….. [2]

(d) Determine the maximum potential difference across the diode during one cycle.

potential difference = …… V [1]

(e) State the potential difference across A and B when the diode has maximum potential difference across it. Give a reason for your answer.

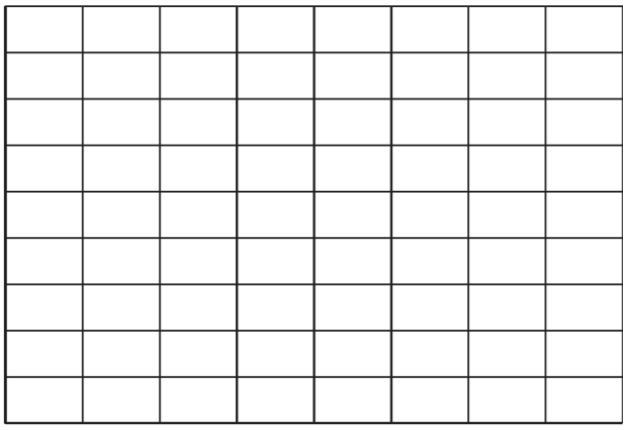
……

……..… [1]

(f) R has a resistance of 5.0 Ω .

In Fig. 3.2, sketch the variation with time of the power dissipated in R for **one** period of the alternating supply.

power



time

Fig. 3.2

[3]

[Total: 9]