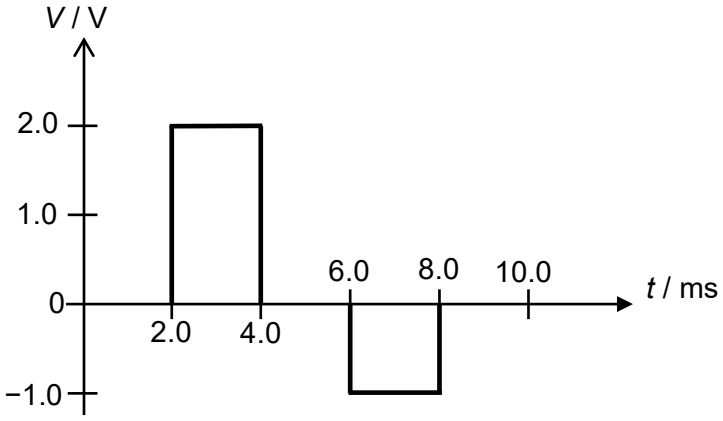
6 **(a)** An alternating voltage of period 10 ms is being applied directly across a resistor of 5.0 Ω in a circuit. The variation with time *t* of voltage *V* is shown in Fig. 6.1.



0

Fig. 6.1

Calculate the steady voltage that would produce an identical heating effect in the same resistor.

voltage = ... V [2]

(b) Explain why it is necessary to use high voltages for the efficient transmission of electrical energy.

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……..…….
[2]

(c) A sinusoidal voltage of 6.5 mV r.m.s. and 50 Hz is now connected to the primary coil of a transformer as shown in Fig. 6.2.

The transformer is assumed to be ideal and its turns ratio, $\frac{N_{\text{secondary}}}{N_{\text{primary}}}$ is 71.

The secondary coil is connected to a resistor *R*.

An average power of 0.040 W is produced in resistor *R*.

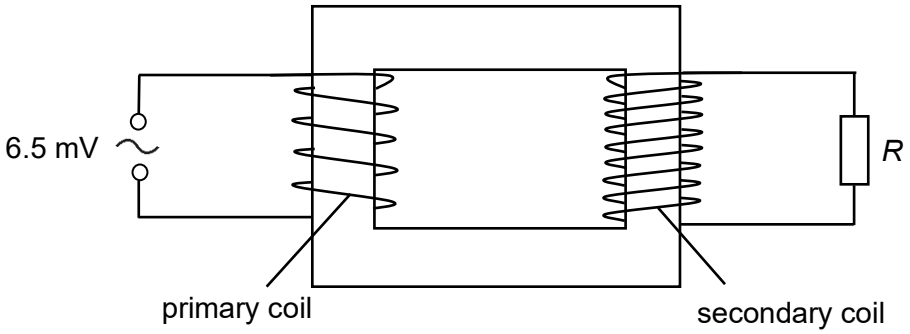

Fig. 6.2

(i) Calculate the r.m.s output voltage supplied to resistor *R*.

r.m.s. voltage = ... V [1]

(ii) In Fig. 6.3, sketch the variation with time *t* of the power *P* dissipated in the resistor *R*. Label all values on the axes.

Fig. 6.3

[2]

(iii) An ideal diode is now connected to the secondary coil with resistor *R* as shown in Fig. 6.4.

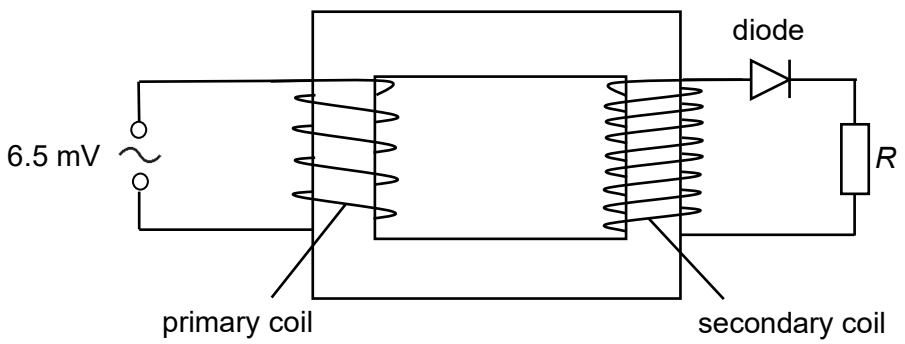

Fig. 6.4

Describe the variation with time of the

1. current flow through resistor *R*, and

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[2]

2. voltage across resistor *R*.

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……
…..

……..……
[1]

[Total: 10]