6 A transformer has a turns ratio of N_p/N_s = 1/20 and the sinusoidal input signal voltage has a value of 9.0 V r.m.s. The mean power input to the transformer is 30 W. A graph of the power input is shown in Fig. 6.1.

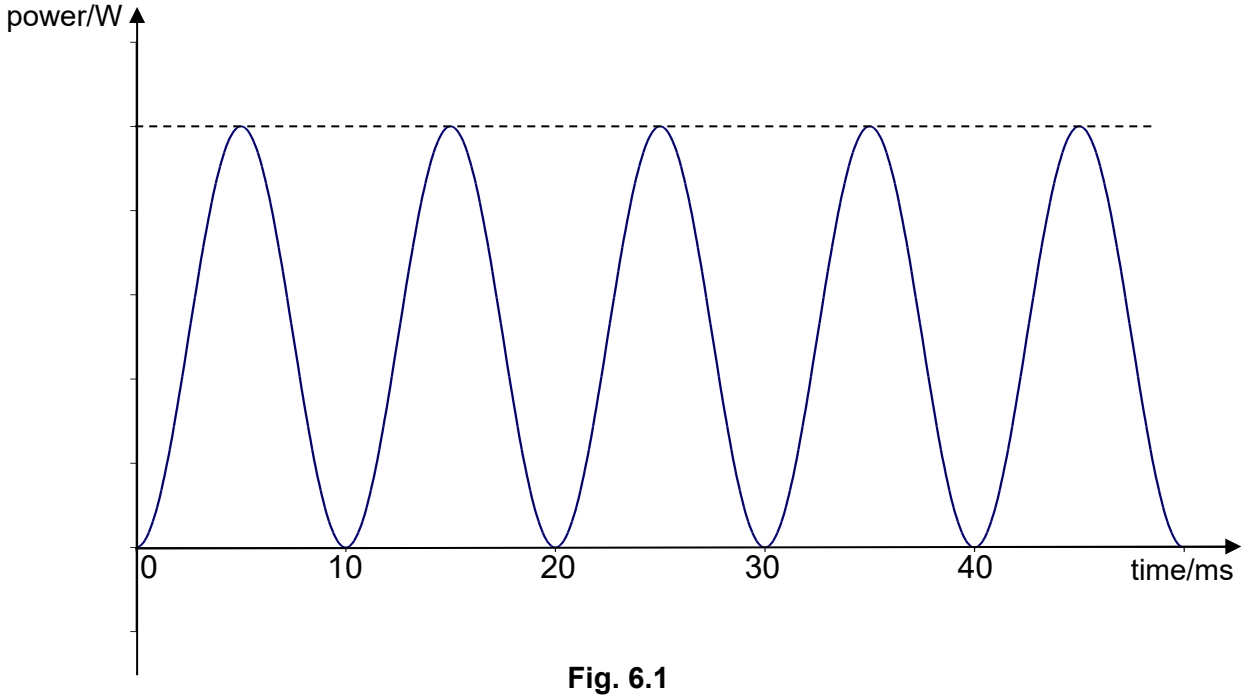

Fig. 6.1

The output of the transformer is connected across a resistor R.

(a) For the transformer, assumed to be ideal, calculate

(i) the r.m.s. value of the output voltage,

r.m.s. output voltage = ……V [1]

(ii) the r.m.s. value of the input current,

r.m.s. input current = ……A [1]

(iii) State the equation of the variation with time t of the output voltage V.

[2]

(b) A diode is inserted in series with the resistor R.

State

(i) the peak power dissipated in R,

peak power = ……W [1]

(ii) the mean power dissipated in R.

mean power = ……W [1]

(c) **(i)** Explain why thermal energy is generated in the core when the transformer is in use.

……

……

……

…… [2]

(ii) State a typical feature in the design of the iron core to reduce power loss.

…… [1]

[Total: 9]