8 Fig. 8.1 shows a circuit that produces rectification of an alternating input voltage.

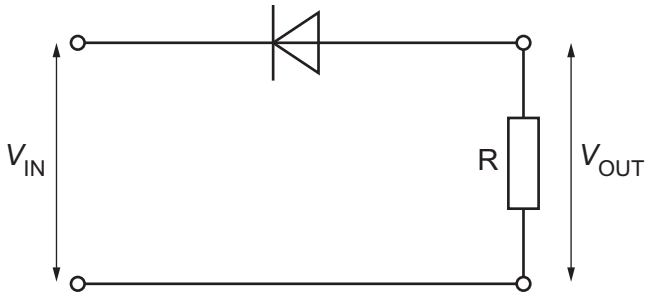

Fig. 8.1

The input voltage V_{IN} is sinusoidal. The rectified output voltage V_{OUT} is applied across resistor R.

The variation of V_{IN} with time t has amplitude V_0 and period T, as shown in Fig. 8.2.

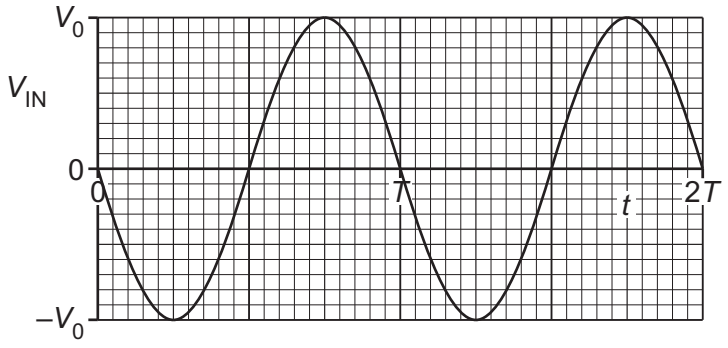

Fig. 8.2

The root-mean-square (r.m.s.) value of V_{IN} is 6.0 V.

(a) (i) State the type of rectification produced by the circuit of Fig. 8.1.

..... [1]

(ii) Calculate V_0.

V_0 = ... V [1]

(b) Resistor R has resistance 45 Ω.

Assume that there is no p.d. across the diode when it is conducting.

(i) Determine the peak power P_0 in the resistor.

P_0 = ... W [2]

(ii) On Fig. 8.3, sketch the variation of the power P in the resistor with t between $t = 0$ and $t = 2T$.

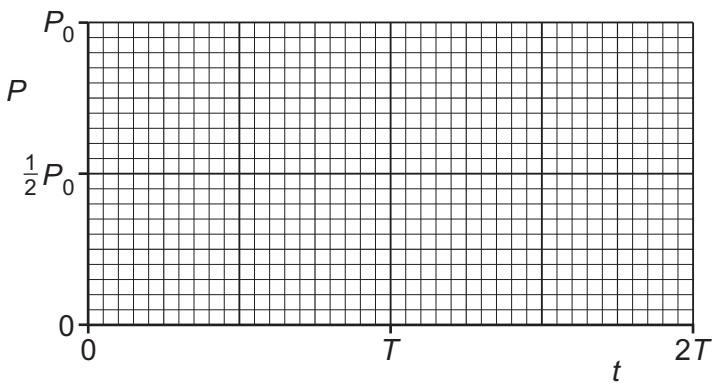

Fig. 8.3

[3]

(iii) Use the answer in **(b)(ii)** to explain why the mean power in the resistor is $\frac{1}{4}P_0$.

.....

.....

..... [2]

(iv) Use the information in **(b)(iii)** to determine the r.m.s. value of V_{OUT}.

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

[Total: 10]