5 **(a)** The variation with time t of the potential difference V_1 across a resistor is shown in Fig. 5.1.

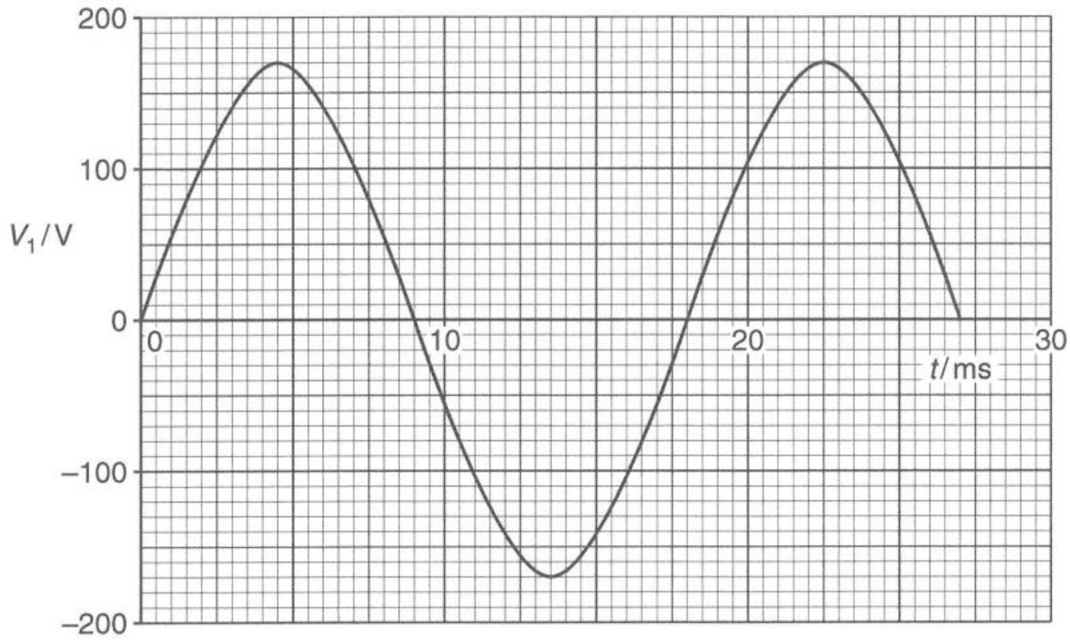

Fig. 5.1

The relation between V_1 and t is given by

$$V_1 = V_0 \sin \omega t \, .$$

Use Fig. 5.1 to determine the root-mean-square voltage of V_1.

root-mean-square voltage = ... V [1]

(b) The potential difference V_1 shown in Fig. 5.1 is connected to an ideal transformer, as shown in Fig. 5.2. The primary coil has 500 turns and the secondary coil has 20 turns. The secondary coil is connected to an open switch and a 15 Ω resistor.

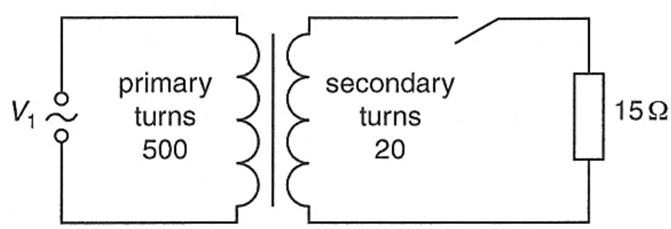

Fig. 5.2

The switch in the secondary circuit is now closed.

Determine

(i) the peak current in the 15 Ω resistor,

peak current = ... A [2]

(ii) the mean power dissipated in the 15 Ω resistor.

mean power dissipated = ... W [2]

(c) For a non-ideal transformer, suggest why thermal energy is generated in the soft iron core when the transformer is in use.

....

....

....

....[2]

[Total: 7]