9 An ideal transformer is shown in Fig. 9.1.
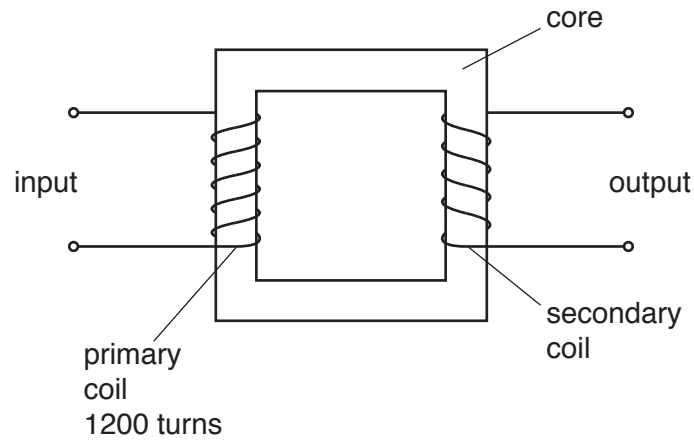

Fig. 9.1

(a) Explain

   (i) why the core is made of iron,

   ....

   ....[1]

   (ii) why an electromotive force (e.m.f.) is not induced at the output when a constant direct voltage is at the input.

   ....

   ....

   ....[2]

(b) An alternating voltage of peak value 150 V is applied across the 1200 turns of the primary coil. The variation with time t of the e.m.f. E induced across the secondary coil is shown in Fig. 9.2.
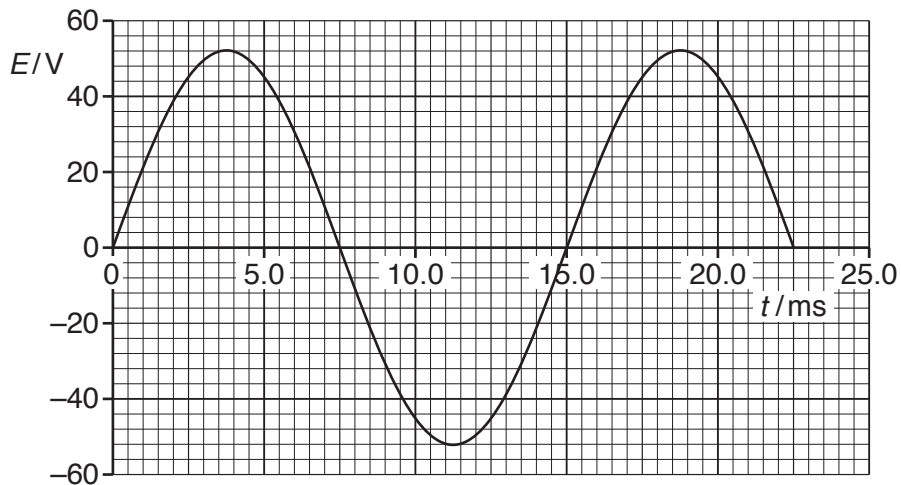

Fig. 9.2

Use data from Fig. 9.2 to

(i) calculate the number of turns of the secondary coil,

number = ...[2]

(ii) state one time when the magnetic flux linking the secondary coil is a maximum.

time = ...ms [1]

(c) A resistor is connected between the output terminals of the secondary coil. The mean power dissipated in the resistor is 1.2 W. It may be assumed that the varying voltage across the resistor is equal to the varying e.m.f. E shown in Fig. 9.2.

(i) Calculate the resistance of the resistor.

resistance = ...Ω [2]

(ii) On Fig. 9.3, sketch the variation with time t of the power P dissipated in the resistor for $t = 0$ to $t = 22.5$ ms.

Fig. 9.3
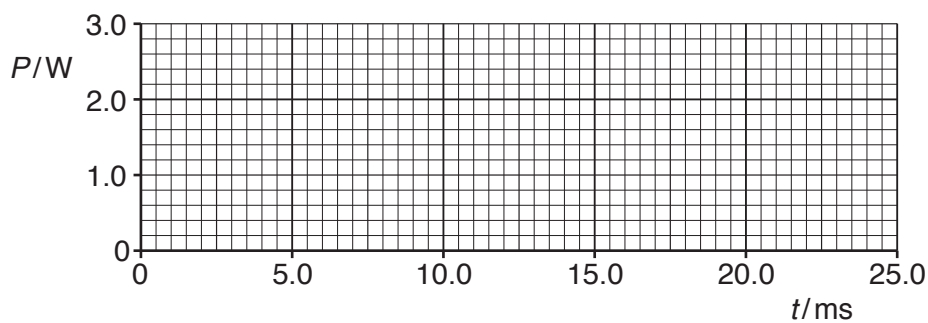
[3]

[Total: 11]