6 An ideal iron-cored transformer is illustrated in Fig. 6.1.

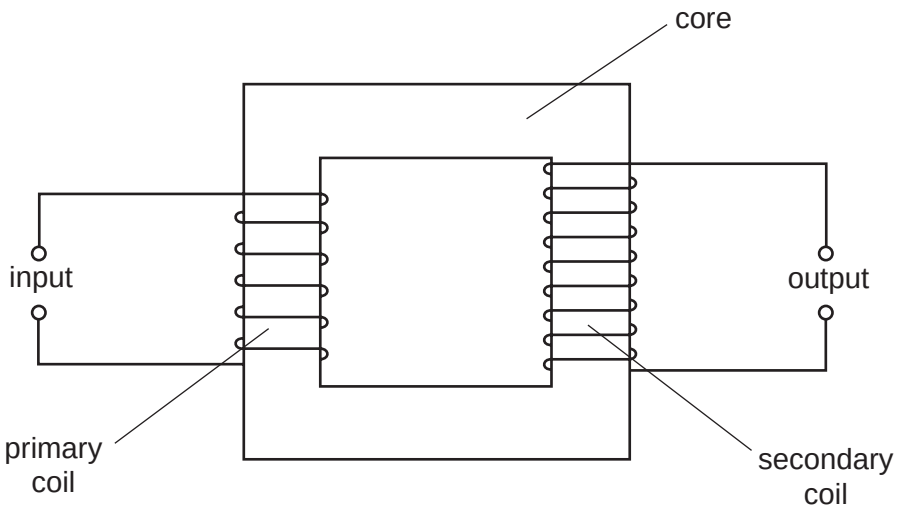

Fig. 6.1

(a) Explain why

(i) the supply to the primary coil must be alternating current, not direct current,

.....

.....

.....[2]

(ii) for constant input power, the output current must decrease if the output voltage increases.

.....

.....

.....[2]

(b) Fig. 6.2 shows the variation with time *t* of the current I_p in the primary coil. There is no current in the secondary coil.

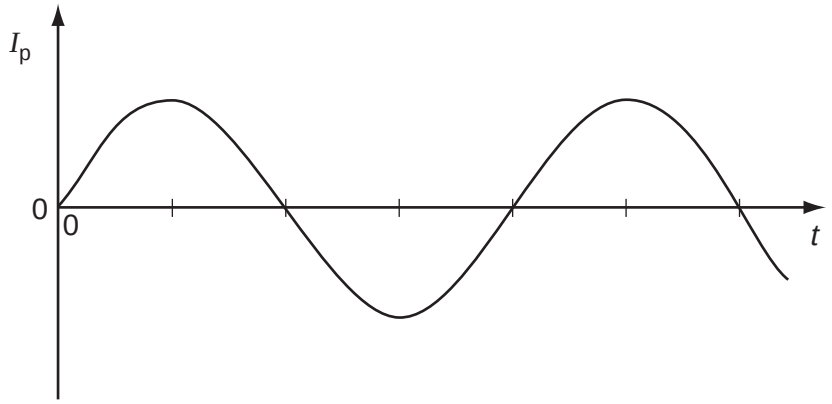

Fig. 6.2

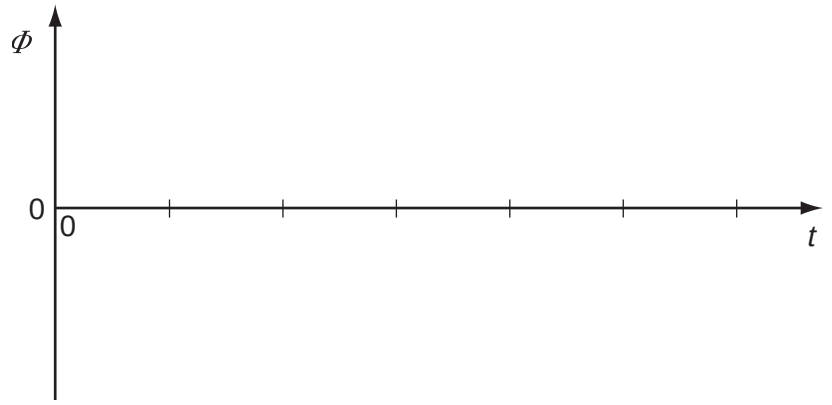

Fig. 6.3

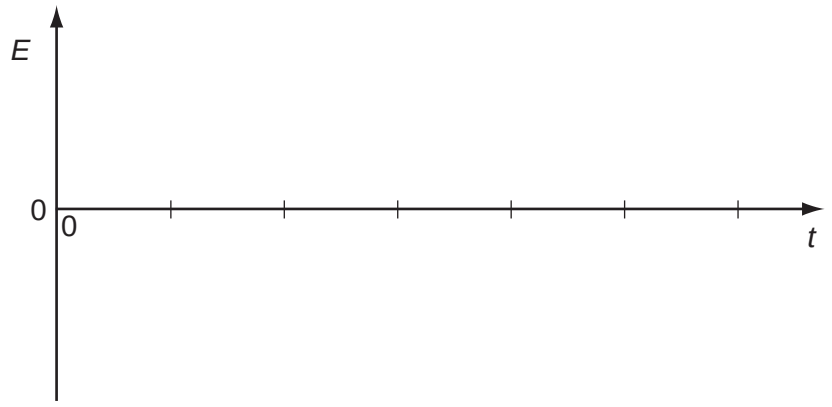

Fig. 6.4

(i) Complete Fig. 6.3 to show the variation with time *t* of the magnetic flux Φ in the core. [1]

(ii) Complete Fig. 6.4 to show the variation with time *t* of the e.m.f. *E* induced in the secondary coil. [2]

(iii) Hence state the phase difference between the current I_p in the primary coil and the e.m.f. *E* induced in the secondary coil.

[1]