11 **(a)** State Faraday's law of electromagnetic induction.

.....

.....

..... [2]

(b) A solenoid S has a small coil C placed near to one of its ends, as shown in Fig. 11.1.

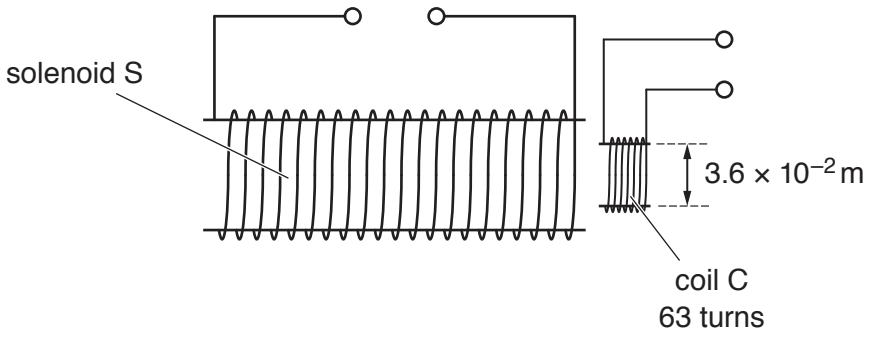

Fig. 11.1

The coil C has a circular cross-section of diameter 3.6×10^{-2} m and contains 63 turns of wire.

The solenoid S produces a uniform magnetic field of flux density B, in tesla, in the region of coil C given by the expression

$$B = 9.4 \times 10^{-4} I$$

where I is the current, in ampere, in the solenoid S.

The variation with time t of the current I in solenoid S is shown in Fig. 11.2.

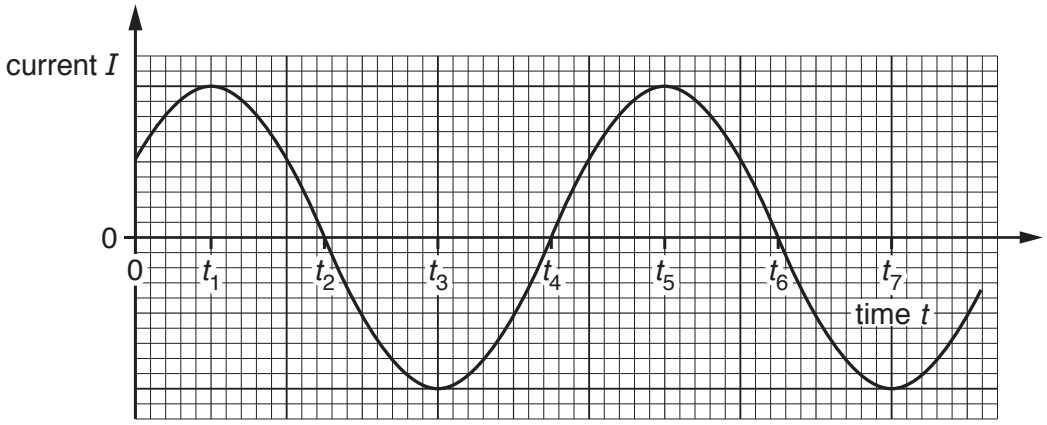

Fig. 11.2

State two times at which:

(i) there is no electromotive force (e.m.f.) induced in coil C

time ..... and time ..... [1]

(ii) the induced e.m.f. in coil C is a maximum but with opposite polarities.

time ..... and time ..... [1]

(c) The alternating current in the solenoid S in **(b)** is replaced by a constant current of 5.0 A.

Calculate the average e.m.f. induced in coil C when the current in solenoid S is reversed in a time of 6.0 ms.

e.m.f. induced = ... V [3]

[Total: 7]