4 **(a)** Define *magnetic flux*.

For Examiner's Use

.....

.....[1]

(b) A coil with 500 turns is placed in a uniform magnetic field of flux density 5.0×10^{-2}T. The area of the coil perpendicular to the field is $2.5 \times 10^{-2}\,m^2$, as shown in Fig. 4.1.

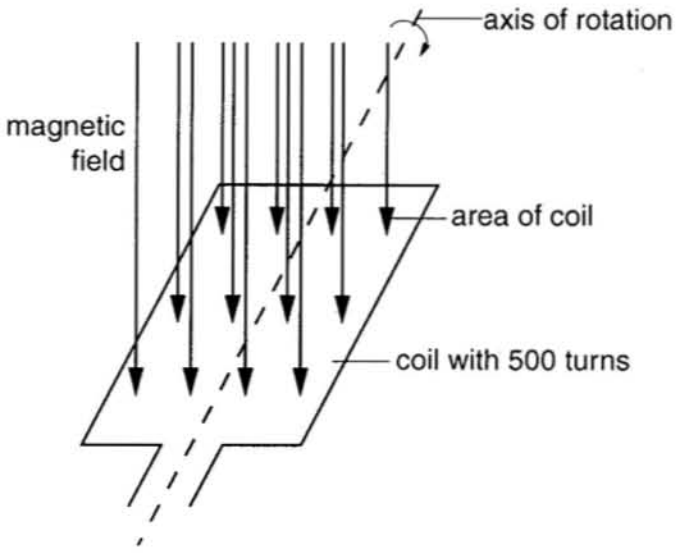

Fig. 4.1

Calculate the magnetic flux linkage of the coil. Give an appropriate unit.

magnetic flux linkage = ... [2]

(c) The coil in **(b)** is rotated around the axis shown in Fig. 4.1. The flux linkage Φ of the coil varies with time t, as shown in Fig. 4.2.

For Examiner's Use

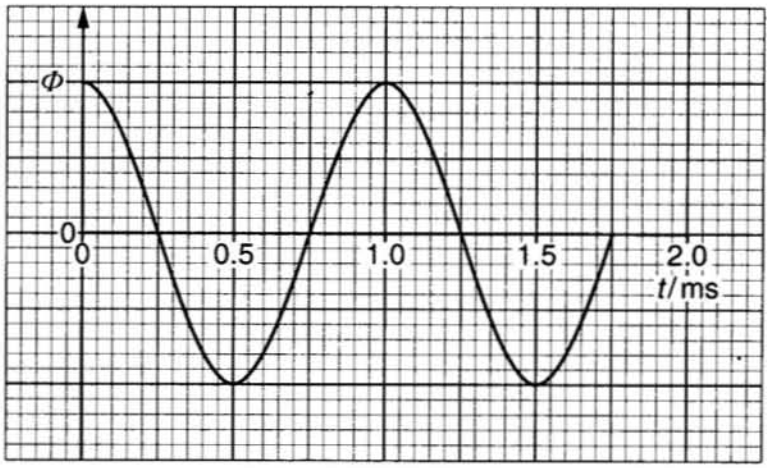

Fig. 4.2

(i) Explain why the flux linkage changes as the coil is rotated.

.....

.....[1]

(ii) Calculate the average e.m.f. induced across the coil when it rotates through the first quarter of a revolution.

e.m.f. = ... V [2]

(iii) Explain how the maximum e.m.f. induced across the coil is determined from Fig. 4.2.

.....

.....

.....[1]

[Turn over