6 **(a)** An alternating current generator has a coil of area 0.090 m^2 and consists of 8 turns of wire. This coil rotates in a uniform magnetic field at a constant rate. The variation with time of the induced e.m.f. in the coil is shown in Fig. 6.1.

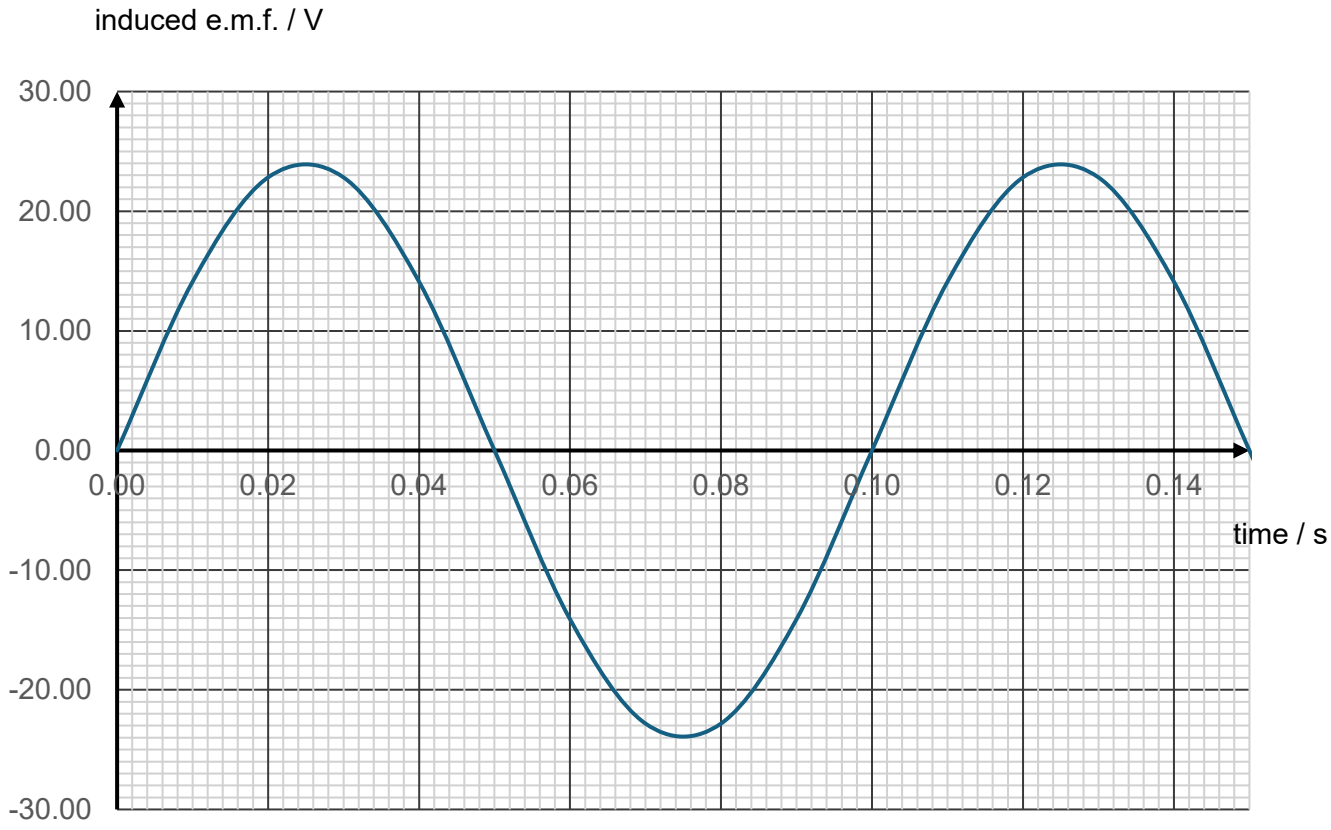

Fig. 6.1

(i) State Faraday's Law of electromagnetic induction.

.....

.....

..... [1]

(ii) Use Fig. 6.1 to estimate the maximum magnetic flux linkage through the coil. Explain your working.

maximum magnetic flux linkage= ..... Wb [2]

(b) **(i)** Use your answer in **(a)(ii)** to determine the magnetic flux density of the magnetic field.

magnetic flux density = ... T [2]

(ii) Calculate the angular frequency of the rotation.

angular frequency = ... rad s^{-1} [1]

(c) The angular frequency of the rotation can be varied.

In Fig. 6.2, sketch the variation with angular frequency of the maximum induced e.m.f.

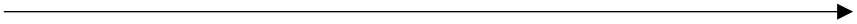

Fig. 6.2

[1]

(d) The coil in **(a)** is connected to a pair of slip-rings which produces an alternating current at the output terminal. The circuit is closed with a resistor of resistance 12 Ω. Ignore the resistance of the coil in the generator.

(i) Calculate the root-mean-square current through the resistor.

root-mean-square current = ... A [2]

(ii) Determine the mean power output of the resistor.

mean power output= ..... W [1]