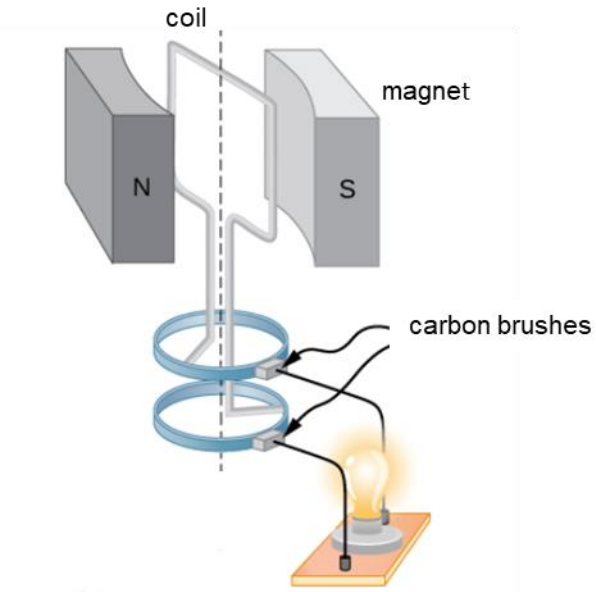
**3** **(a)** Explain what is meant by *magnetic flux linkage*.

……..

……..... [1]

**(b)** Fig. 3.1 shows a simple generator that is used to generate electricity. A coil of wire of area 265 $cm^2$ is placed between two permanent magnets. The magnets provide a uniform magnetic flux density of 6.2 T and the coil rotates at a constant angular frequency of 30 revolutions per minute.




*Source: https://openstax.org/*

**Fig. 3.1**

**(i)** Explain how a sinusoidal current is generated in the coil.

……

……

……

……

……

……

……..… [3]

**(ii)** Show that the maximum magnitude of the e.m.f. induced in the coil is 0.52 V.

[2]

**(iii)** On Fig. 3.2, sketch the variation with time *t* of the e.m.f. *E* generated in the coil. The orientation of the coil, seen from the top view of Fig. 3.1, is illustrated above the graph in Fig. 3.2.

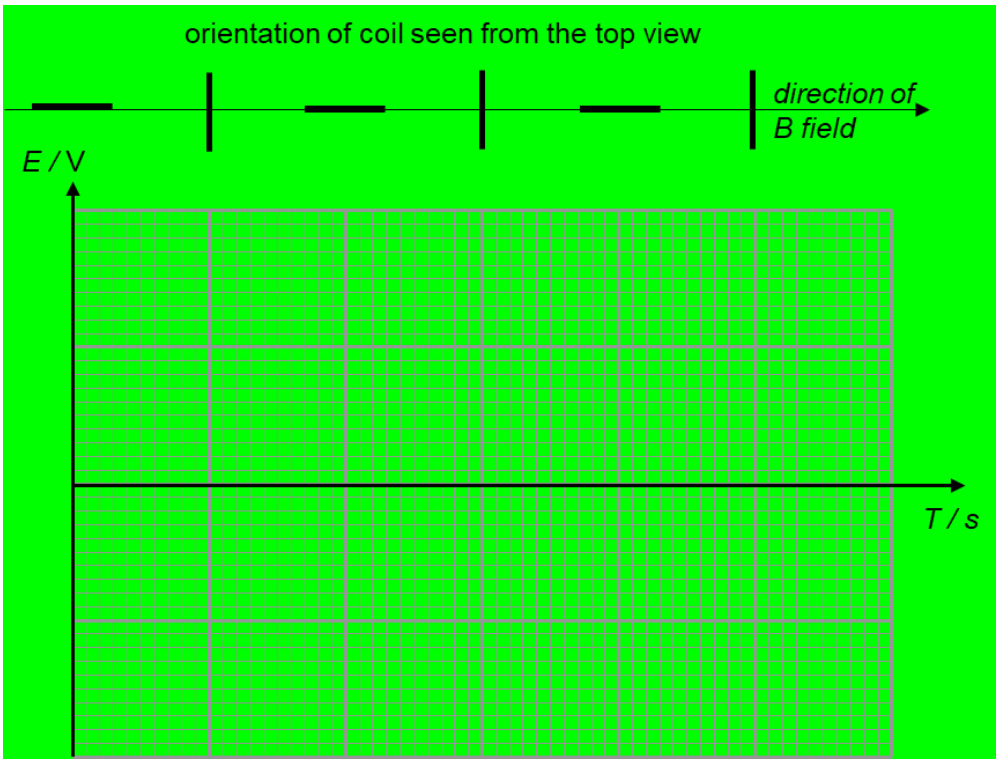



**Fig. 3.2**

[2]

**(c)** The e.m.f. generated in **(b)** is now channelled to the input of a transformer as shown in Fig. 3.3.

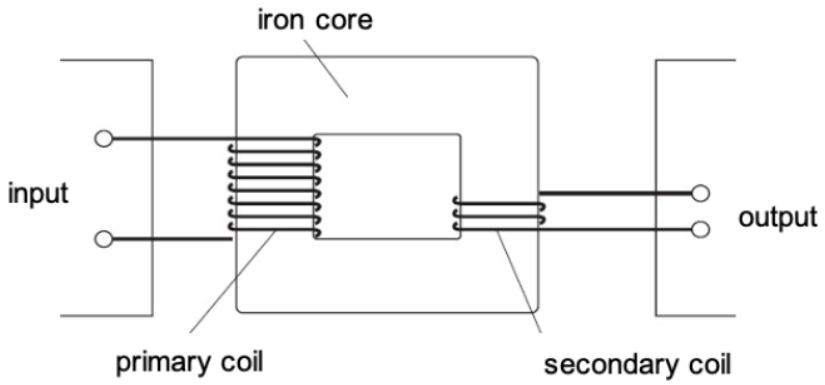



**Fig. 3.3**

**(i)** Determine the root-mean-square (r.m.s.) voltage, $V_{rms}$, in the primary coil.

$V_{rms}$ = ..... V [1]

**(ii)** The output of the transformer is connected to a resistor of resistance 10 Ω. The turns ratio of the transformer $\frac{N_s}{N_p}$ is 0.25.

Determine the r.m.s. current, $I_{rms}$, across the resistor.

$I_{rms}$ = …… A [2]

[Total: 11]