6 **(a)** State Faraday's Law of Electromagnetic Induction.

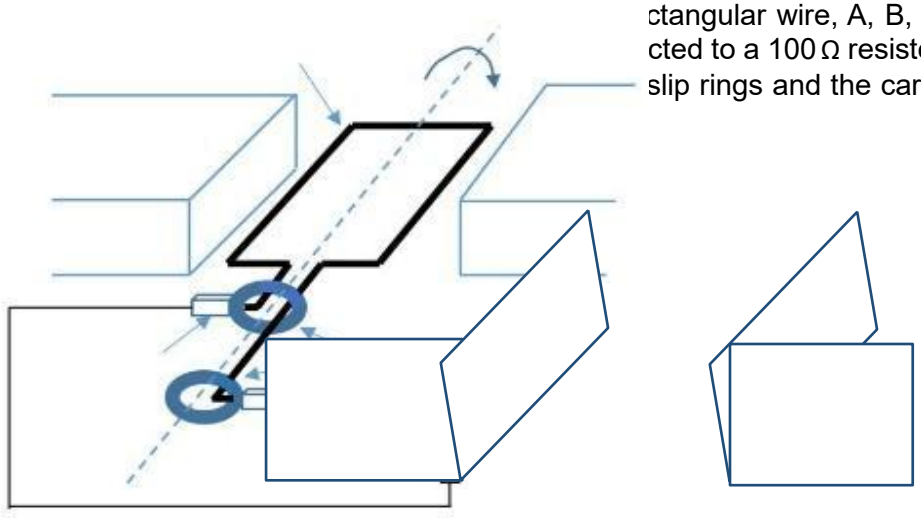
_____.

._____.

._____

_____.[2]

(b) A ctangular wire, A, B, C and D, inside a ur cted to a 100 Ω resistor. The connecting wi slip rings and the carbon brushes have ze



resistance.

slip rings

carbon brush

Fig. 6.1

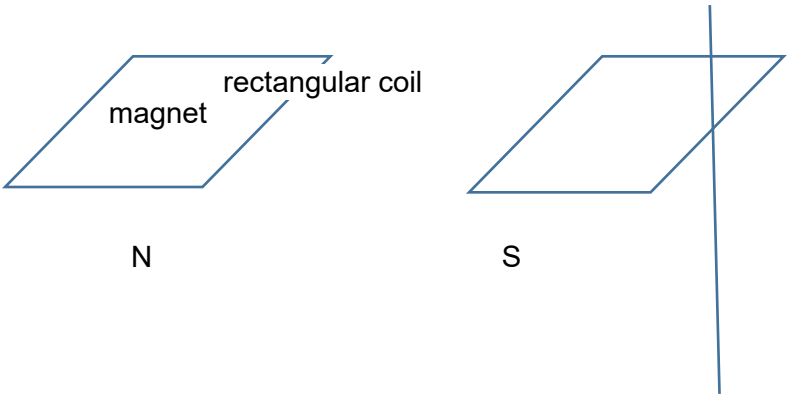
resistor (100 Ω)

A

B

C

D



The magnetic flux density in the region between the poles of the magnet is 50.0 mT.

The rectangular coil has a length AB of 8.0 cm and width BC of 5.0 cm.

The coil is rotated at a frequency of 180 revolutions per minute.

The number of turns in the coil is 40.

(i) Calculate the angular frequency of the coil.

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

(ii) On Fig. 6.2, sketch the variation with time t of the flux linkage Φ through the coil from the time t = 0 s when the plane of the coil is parallel to the magnetic field, as shown in Fig. 6.1. Include appropriate values of maximum flux linkage and period on the axes. [3]

/Wb-turns

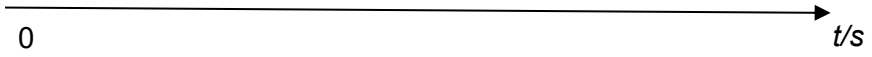


Fig. 6.2

(iii) The maximum generated e.m.f. is 0.151 V.

On Fig. 6.3, show quantitatively the variation with time *t* of the current I flowing through the resistor with reference to the graph you have sketched on Fig. 6.2. [2]

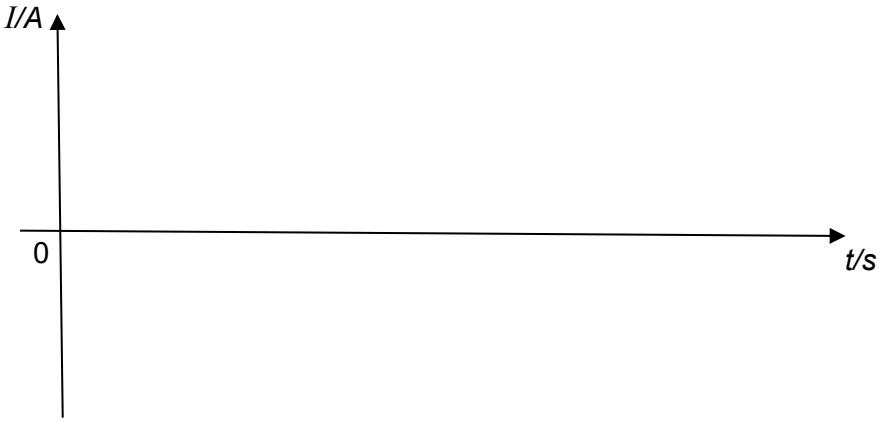


Fig. 6.3

(iv) The frequency of rotation is increased to 360 revolutions per minute.

Determine the maximum generated e.m.f. *E*.

Explain your answer.

E = _____ V

.

. _____ [2]
_____.

[Total: 10]