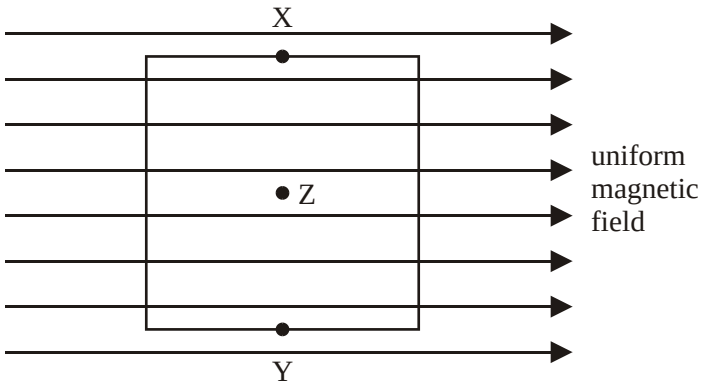
Electromagnetic Induction Name .....

1.



The diagram shows a square coil with its plane parallel to a uniform magnetic field. Which one of the following would induce an emf in the coil?

A movement of the coil slightly to the left

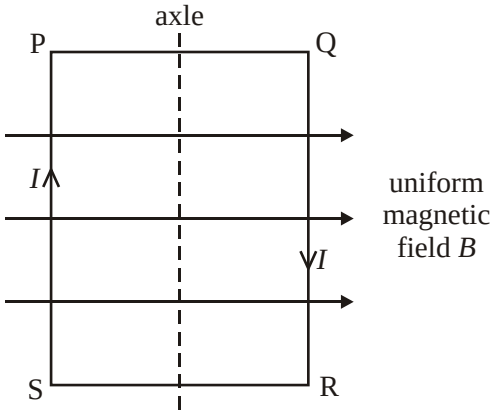
B movement of the coil slightly downwards

C rotation of the coil about an axis through XY

D rotation of the coil about an axis perpendicular to the plane of the coil through Z

(Total 2 marks)

2.



A coil, mounted on an axle, has its plane parallel to the flux lines of a uniform magnetic field *B*, as shown. When a current I is switched on, and before the coil is allowed to move,

A there are no forces due to *B* on the sides PQ and RS.

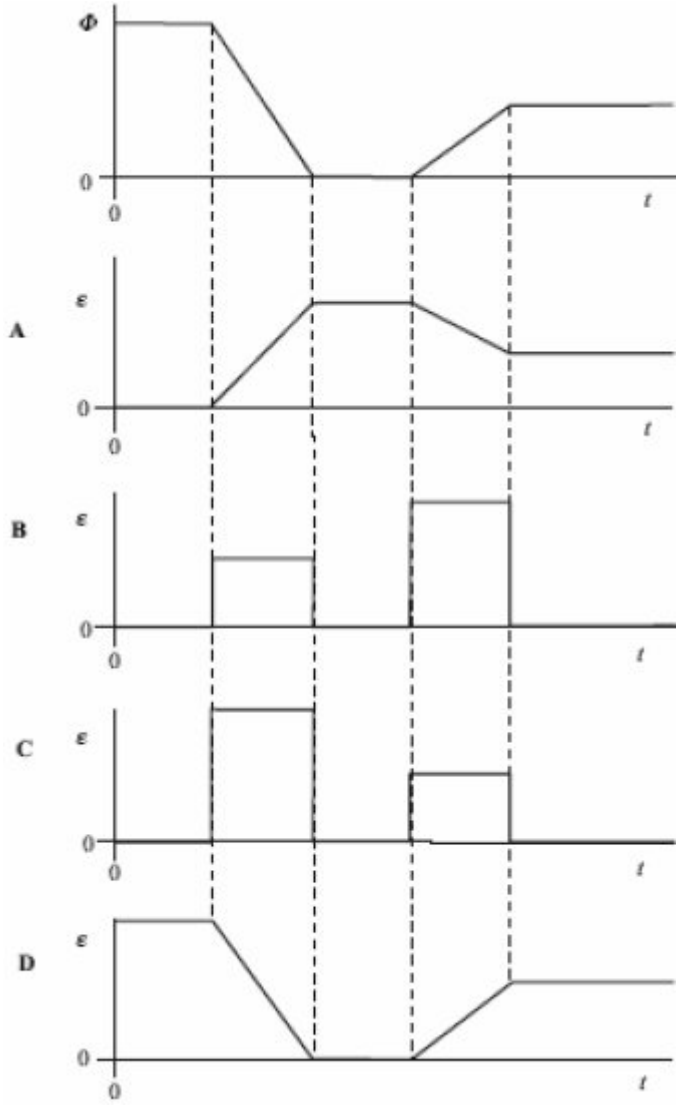
B there are no forces due to *B* on the sides SP and QR.

C sides SP and QR attract each other.

D sides PQ and RS attract each other.

(Total 2 marks)

3. The magnetic flux, Φ, through a coil varies with time, t, as shown by the first graph. Which one of the following graphs, A to D, best represents how the magnitude, $\in$, of the induced emf varies in this same period of time?



(Total 1 mark)

4. A metal aircraft with a wing span of 42m flies horizontally with a speed of 1000 km h^{-1} in a direction due east in a region where the vertical component of the flux density of the Earth's magnetic field is 4.5×10^{-5} T.

(i) Calculate the flux cut per second by the wings of the aircraft.

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(ii) Determine the magnitude of the potential difference between the wing tips, stating the law which you are applying in this calculation.

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(iii) What would be the change in the potential difference, if any, if the aircraft flew due west?

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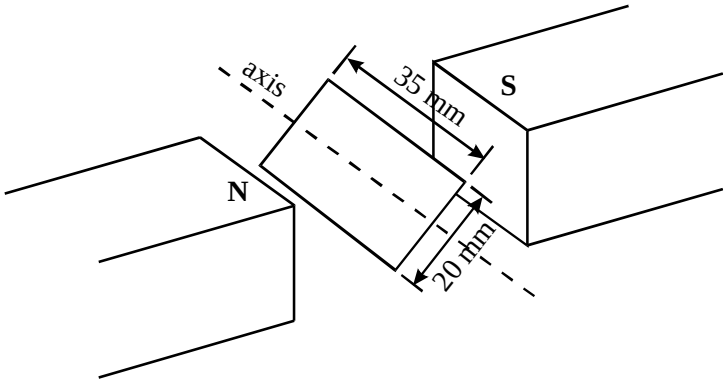
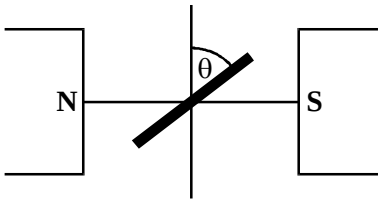
(Total 6 marks)

5. A rectangular coil measuring 20 mm by 35 mm and having 650 turns is rotating about a horizontal axis which is at right angles to a uniform magnetic field of flux density 2.5×10^{-3} T. The plane of the coil makes an angle θ with the vertical, as shown in the diagrams.





front view

(a) State the value of θ when the magnetic flux through the coil is a minimum.

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(1)

(b) Calculate the magnetic flux passing through the coil when θ is 30°.

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(2)

(c) What is the maximum *flux linkage* through the coil as it rotates?

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(2)

(d) A timer is started when the flux linkage is maximum. The coil is rotated at a frequency of 10Hz. Sketch a graph of flux linkage against time showing at least two rotations of the coil: