Electromagnetism – Past Paper Questions

Name ……

1. Why, when transporting electricity on the National Grid, are high voltages and low currents used?

A The energy lost by radiation from electromagnetic waves is reduced.

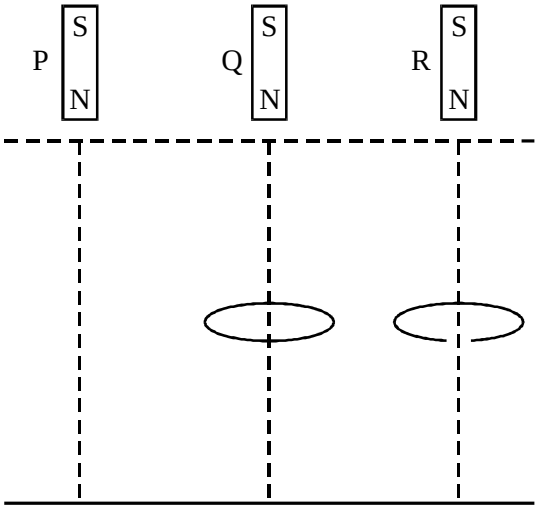
B The electrons move more rapidly.

C The heat losses are reduced.

D The resistance of the power lines is reduced.

(Total 1 mark)

2.



Three identical magnets P, Q and R are released simultaneously from rest and fall to the ground from the same height. P falls directly to the ground, Q falls through the centre of a thick conducting ring and R falls through a ring which is identical except for a gap cut into it. Which one of the statements below correctly describes the sequence in which the magnets reach the ground?

A P and R arrive together followed by Q.

B P and Q arrive together followed by R.

C P arrives first, followed by Q which is followed by R.

D All three magnets arrive simultaneously.

(Total 2 marks)

3. The primary winding of a perfectly efficient transformer has 200 turns and the secondary has 1000 turns. When a sinusoidal pd of rms value 10 V is applied to the input, there is a primary current of rms value 0.10 A rms. Which line in the following table, **A** to **D**, gives correct rms output values obtainable from the secondary when the primary is supplied in this way?

	rms output emf/V	**rms output current/A**
A	50	0.10
B	50	0.02
C	10	0.10
D	10	0.02

(Total 1 mark)

4.

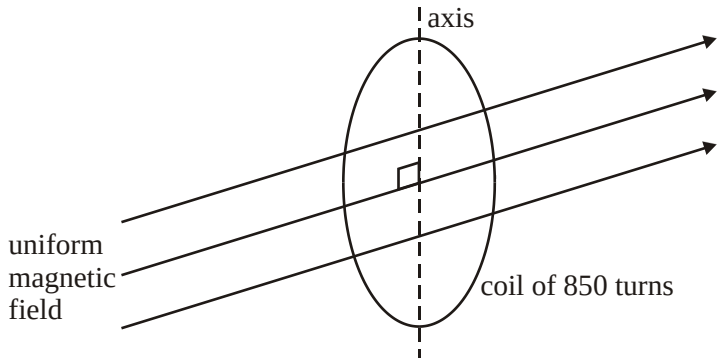


Figure 1

A circular coil of diameter 140 mm has 850 turns. It is placed so that its plane is perpendicular to a horizontal magnetic field of uniform flux density 45 mT, as shown in **Figure 1**.

(a) Calculate the magnetic flux passing through the coil when in this position.

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(2)

(b) The coil is rotated through 90° about a vertical axis in a time of 120 ms.

Calculate

(i) the change of magnetic flux linkage produced by this rotation,

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(ii) the average emf induced in the coil when it is rotated.

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(4)
(Total 6 marks)

5. 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)