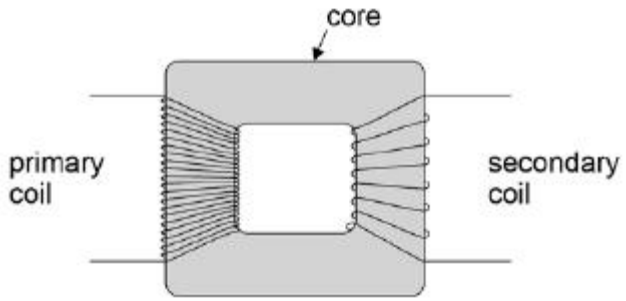
Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Q1.

Figure 1 shows a step−down transformer used in a laptop power supply.

Figure 1



(a) Explain the purpose of the core in the transformer.

_____

_____

(1)

(b) Describe and explain **two** features of the core that improve the efficiency of the transformer.

1. _____

_____

_____

2. _____

_____

_____

(2)

(c) Explain why transformers only work continuously when supplied with an alternating current.

_____

_____

_____

_____

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(1)

(d) The primary coil of the transformer is connected to a 230 V_{rms} ac supply. The current in the primary coil is 0.30 A_{rms}. The secondary coil has 300 turns and provides an output of 20 V_{rms} and a power of 65 W.

Calculate the number of turns on the primary coil.

number of turns on primary =_____

(1)

(e) Calculate the efficiency of the transformer.

efficiency _____

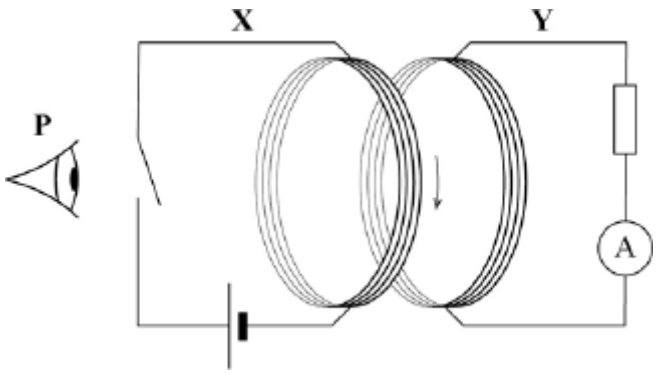
(2)

(Total 7 marks)

Q2.

Figure 1 shows an arrangement for investigating electromagnetic induction.

Figure 1



When the switch is closed there is a current in the coil in circuit **X**. The current is in a clockwise direction as viewed from position **P**.

Circuit **Y** is viewed from position **P**.

(a) Explain how Lenz's law predicts the direction of the induced current when the switch is opened and again when it is closed.

_____

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(4)

An 'Earth inductor' consists of a 500 turn coil. **Figure 2** and **Figure 3** shows it set up to measure the horizontal component of the Earth's magnetic field. When the coil is rotated an induced emf is produced.

Figure 2

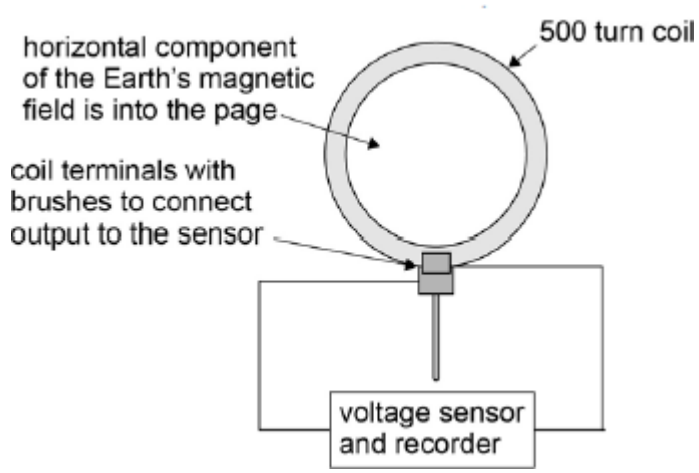
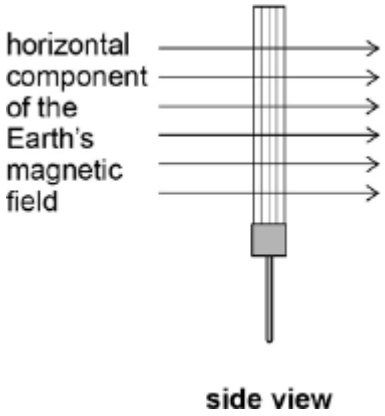


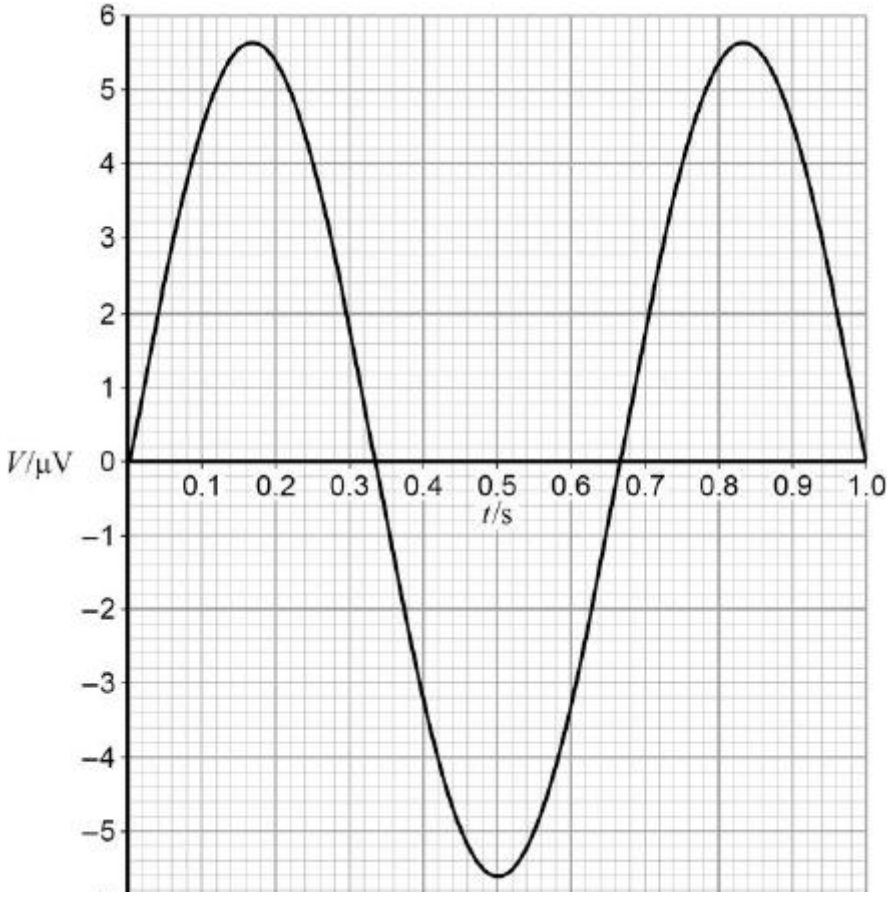
Figure 3



The mean diameter of the turns on the coil is 35 cm. **Figure 4** shows the output recorded for the variation of potential difference V with time t when the coil is rotated at 1.5 revolutions per second.

Figure 4

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(b) Determine the flux density, B_H, of the horizontal component of the Earth's magnetic field.

horizontal component of flux density = _____T

(3)

(Total 7 marks)

Q3.

(a) State, in words, the two laws of electromagnetic induction.

Law 1 _____

_____

_____

_____

Law 2 _____

_____

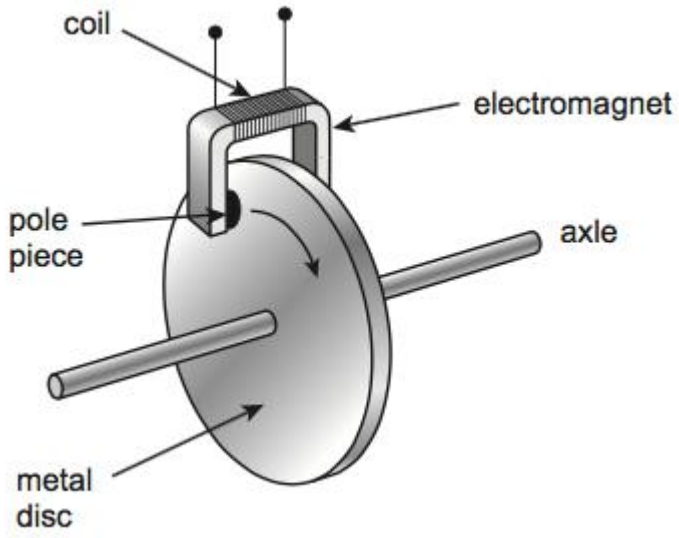
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_____

_____

(3)

(b) The diagram below illustrates the main components of one type of electromagnetic braking system. A metal disc is attached to the rotating axle of a vehicle. An electromagnet is mounted with its pole pieces placed either side of the rotating disc, but not touching it. When the brakes are applied, a direct current is passed through the coil of the electromagnet and the disc slows down.



(i) Explain, using the laws of electromagnetic induction, how the device in the diagram acts as an electromagnetic brake.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(ii) A conventional braking system has friction pads that are brought into contact with a moving metal surface when the vehicle is to be slowed down.
State **one** advantage and **one** disadvantage of an electromagnetic brake compared to a conventional brake.

Advantage _____

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_____

_____

Disadvantage _____

_____

_____

(2)

(Total 8 marks)

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