Q1.

A wire is at right angles to a uniform magnetic field and carries an electric current.
The wire is 150 mm in length.

When the current in the wire is increased by 4.0 A, the force acting on the wire increases by 3.6×10^{-3} N.

What is the magnetic flux density of the field?

A 6.0×10^{-6} T ○

B 6.0×10^{-3} T ○

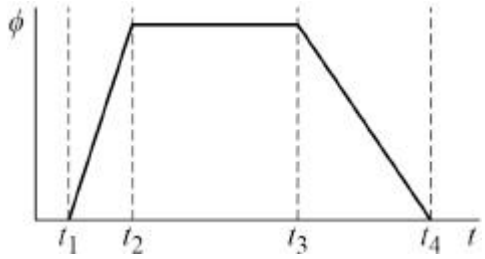
C 1.7×10^{2} T ○

D 1.7×10^{5} T ○

(Total 1 mark)

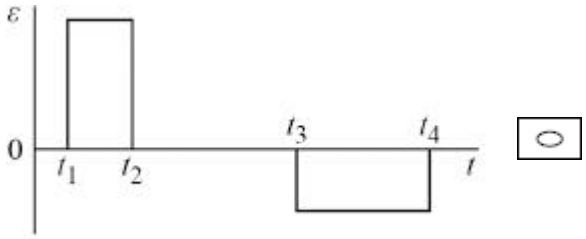
Q2.

The magnetic flux ϕ in a coil varies with time t as shown.



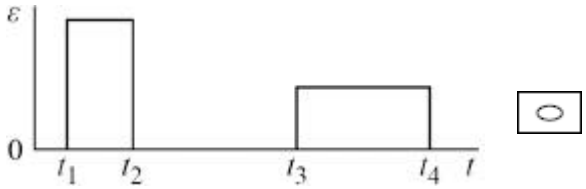
Which graph shows how the emf ε induced in the coil varies with t ?

A



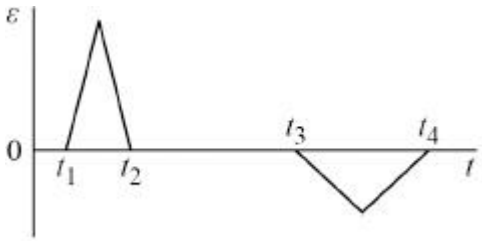
○

B

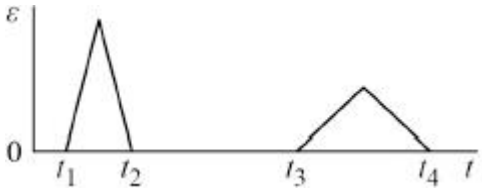


○

C



D



(Total 1 mark)

Q3.

The distance between the wing tips of a metal aircraft is 30 m.
The aircraft flies horizontally at a steady speed of 100 m s^{-1}.
The aircraft passes through a vertical magnetic field of flux density 2.0×10^{-7} T.

What is the emf induced between its wing tips?

A 0.2 μV

B 20 μV

C 300 μV

D 600 μV

(Total 1 mark)

Q4.

A circular coil with a radius of 0.10 m has 200 turns.
The coil rotates at 50 revolutions per second about an axis which is perpendicular to a uniform magnetic field and in the plane of the coil.
The magnetic flux density of the field is 0.20 T.

What is the maximum emf induced in the coil?

A 63 V

B 126 V

C 195 V

D 395 V

(Total 1 mark)

Q5.

A transformer for use in a 230 V ac supply is 90% efficient.
The transformer provides a current of 3.00 A at 12.0 V.

What is the current in the primary coil?

A 0.141 A ○

B 0.156 A ○

C 0.174 A ○

D 5.75 A ○

(Total 1 mark)

Q6.

When an electron moves at a speed v perpendicular to a uniform magnetic field of flux density B, the radius of its path is R.

A second electron moves at a speed $\frac{v}{2}$ perpendicular to a uniform magnetic field of flux density $4B$.

What is the radius of the path of the second electron?

A $\frac{R}{8}$ ○

B $\frac{R}{4}$ ○

C $4R$ ○

D $8R$ ○

(Total 1 mark)

Q7.

A coil is rotated at frequency f in a uniform magnetic field.
The magnetic flux linking the coil is a maximum at time t_1 and the emf induced in the coil is a maximum at time t_2.

What is the smallest value of $t_1 - t_2$?

A 0 ○

B $\frac{1}{4f}$ ○

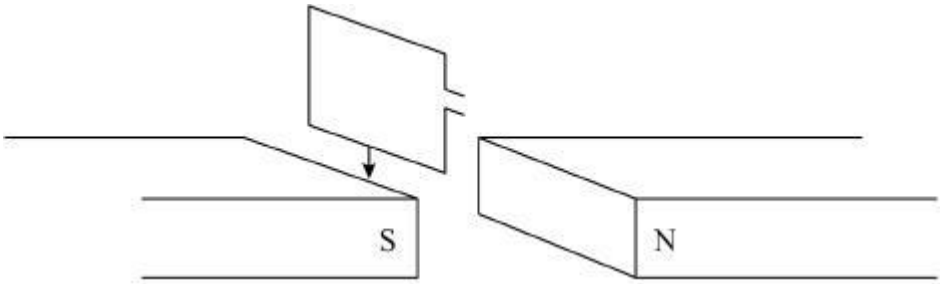
C $\frac{1}{2f}$ ○

D $\frac{3}{4f}$ ○

(Total 1 mark)

Q8.

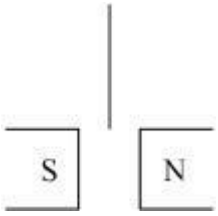
The diagram shows a small rectangular coil falling between two magnetic poles.



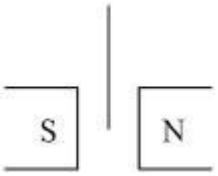
The coil is shown at four instants as it passes through the magnetic field.

At which instant will the induced emf be a maximum?

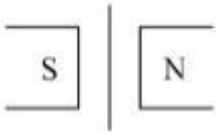
A



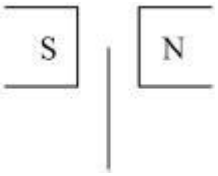
B



C



D



A ⬭

B ⬭

C ⬭

D ⬭

(Total 1 mark)

Mark schemes

Q1.

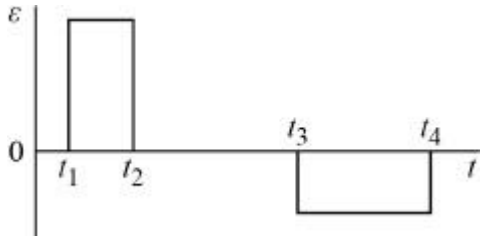
B

6.0 × 10⁻³ T

[1]

Q2.

A



[1]

Q3.

D

600 μV

[1]

Q4.

D

395 V

[1]

Q5.

C

0.174 A

[1]

Q6.

A

[1]

Q7.

B

[1]

Q8.

D

[1]