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

Q1.

Domestic users in the United Kingdom are supplied with mains electricity at a *root mean square voltage* of 230V.

(a) State what is meant by root mean square voltage.

_____

_____

_____

(1)

(b) (i) Calculate the peak value of the supply voltage.

answer = _____ V

(2)

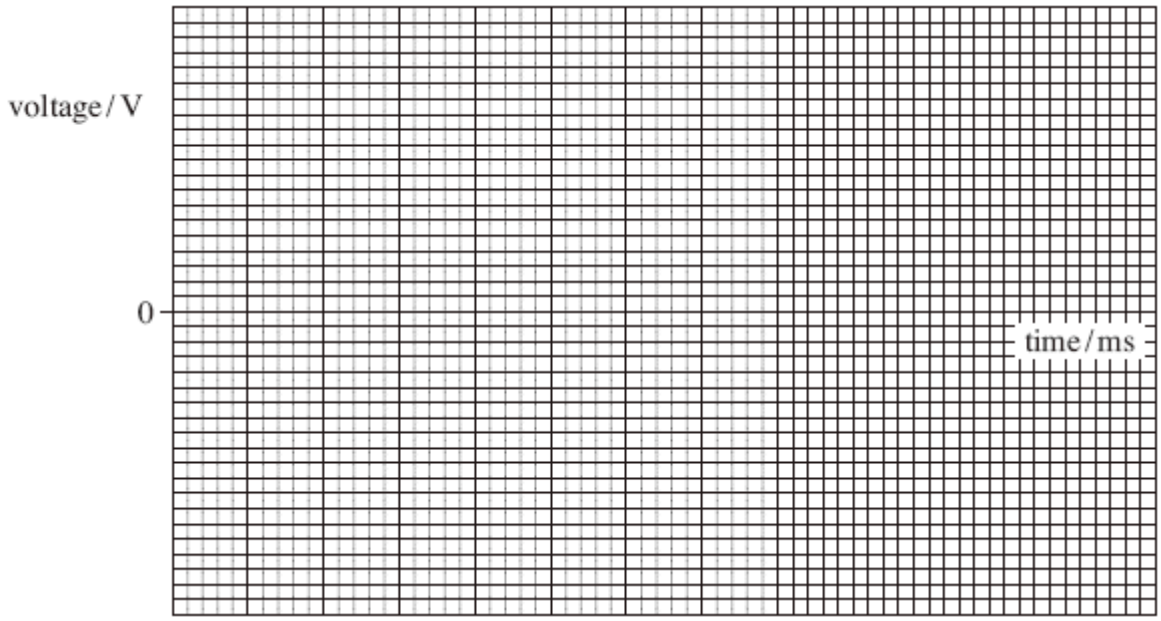
(ii) Calculate the average power dissipated in a lamp connected to the mains supply when the rms current is 0.26 A.

answer = _____ W

(1)

(c) The frequency of the voltage supply is 50 Hz. On the axes below draw the waveform of the

supplied voltage labelling the axes with appropriate values.



(4)

(Total 8 marks)

Q2.

An electron moves due North in a horizontal plane with uniform speed. It enters a uniform magnetic field directed due South in the same plane. Which one of the following statements concerning the motion of the electron in the magnetic field is correct?

A It accelerated due West.

B It slows down to zero speed and then accelerates due South.

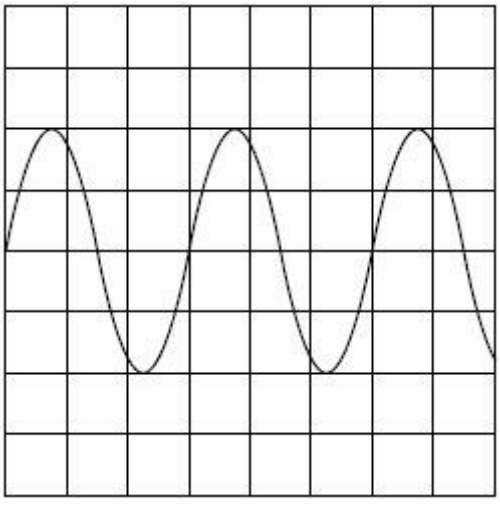
C It continues to move North with its original speed.

D It is accelerated due North.

(Total 1 mark)

Q3.

An alternating current (ac) source is connected to a resistor to form a complete circuit. The trace obtained on an oscilloscope connected across the resistor is shown in the diagram below.



The oscilloscope settings are: Y gain 5.0 V per division
time base 2.0 ms per division.

(i) Calculate the peak voltage of the ac source.

answer = _____ V

(1)

(ii) Calculate the rms voltage.

answer = _____ V

(1)

(iii) Calculate the time period of the ac signal.

answer = _____ ms

(1)

(iv) Calculate the frequency of the ac signal.

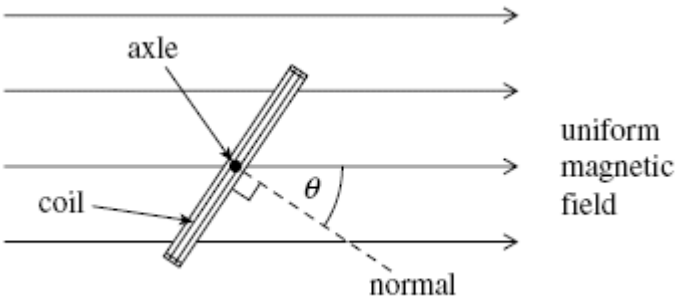
answer = _____ Hz

(2)

(Total 5 marks)

Q4.

The figure below shows an end view of a simple electrical generator. A rectangular coil is rotated in a uniform magnetic field with the axle at right angles to the field direction. When in the position shown in the figure below the angle between the direction of the magnetic field and the normal to the plane of the coil is θ.



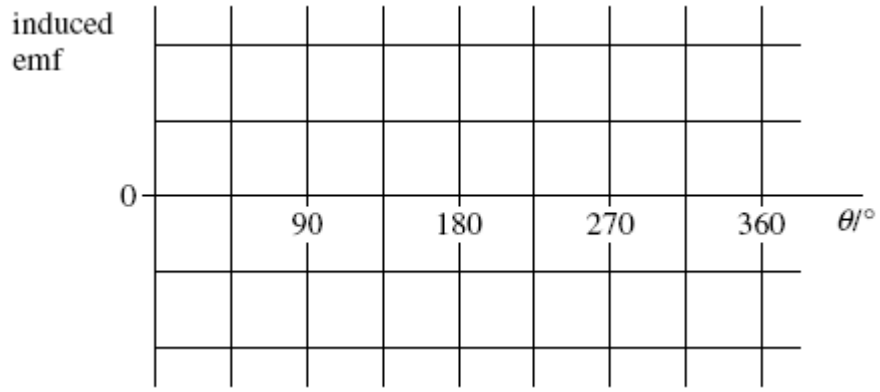
(a) The coil has 50 turns and an area of 1.9×10^{-3} m^2. The flux density of the magnetic field is 2.8×10^{-2} T. Calculate the flux linkage for the coil when θ is 35°, expressing your answer to an appropriate number of significant figures.

answer = _____ Wb turns

(3)

(b) The coil is rotated at constant speed, causing an emf to be induced.

(i) Sketch a graph on the outline axes to show how the induced emf varies with angle θ during one complete rotation of the coil, starting when $\theta = 0$. Values are not required on the emf axis of the graph.



(1)

(ii) Give the value of the flux linkage for the coil at the positions where the emf has its greatest values.

answer = _____ Wb turns

(1)

(iii) Explain why the magnitude of the emf is greatest at the values of θ shown in your answer to part (b)(i).

_____

_____

_____

_____

_____

_____

_____

_____

(3)
(Total 8 marks)