Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Q1.

An electric oven is connected to a 230 V root mean square (rms) mains supply using a cable of negligible resistance.

(a) (i) Calculate the peak-to-peak voltage of the mains supply.

peak-to-peak voltage = _____ V

(2)

(ii) The resistance of the heating element in the oven at its working temperature is 12 Ω.

Calculate the power dissipated by the heating element in the oven.
Give your answer to an appropriate number of significant figures.

power = _____ W

(3)

(b) In practice the resistance of the cable connecting the oven to the mains supply is not negligible. Each of the **two** wires connecting the heating element to the mains electricity supply has a length of 3.15 m. Each metre of wire has a resistance of 0.0150 Ω.

(i) Explain why the rms voltage across the heating element in the oven will be less than 230 V.

_____

_____

_____

_____

(2)

(ii) Calculate the rms voltage across the heating element in the oven when it is at its working temperature.

rms voltage = _____ V

(3)

(iii) Calculate the average power wasted in the cable due to the heating effect of the electric current.

average power = _____ W

(2)

(iv) State **two** reasons why it is important that the cable has a low resistance.

1. _____

_____

_____

2. _____

_____

_____

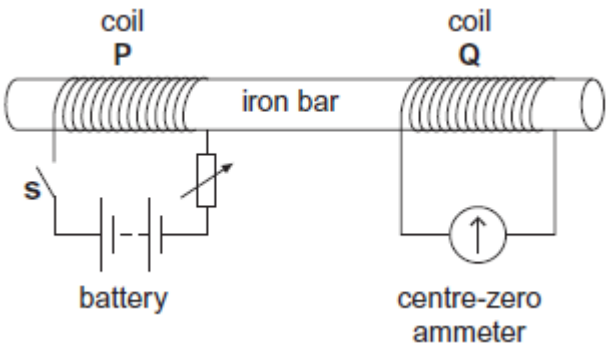
(2)

(Total 14 marks)

Q2.

(a) **Figure 1** shows two coils, **P** and **Q**, linked by an iron bar. Coil **P** is connected to a battery through a variable resistor and a switch **S**. Coil **Q** is connected to a centre-zero ammeter.

Figure 1



(i) Initially the variable resistor is set to its minimum resistance and **S** is open. Describe and explain what is observed on the ammeter when **S** is closed.

_____

_____

_____

_____

_____

_____

(3)

(ii) With **S** still closed, the resistance of the variable resistor is suddenly increased. Compare what is now observed on the ammeter with what was observed in part (i). Explain why this differs from what was observed in part (i).

_____

_____

_____

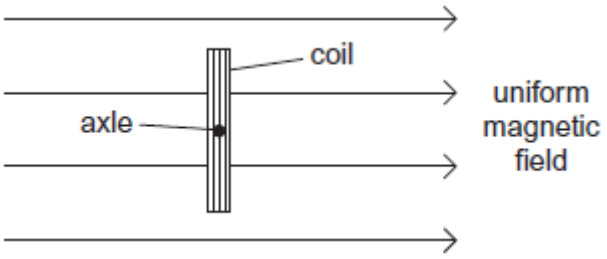
_____

_____

(2)

(b) **Figure 2** shows a 40-turn coil of cross-sectional area 3.6×10^{-3} m^2 with its plane set at right angles to a uniform magnetic field of flux density 0.42 T.

Figure 2



(i) Calculate the magnitude of the magnetic flux linkage for the coil. State an appropriate unit for your answer.

flux linkage _____ unit _____

(2)

(ii) The coil is rotated through 90° in a time of 0.50 s. Determine the mean emf in the coil.

mean emf _____ V

(2)

(Total 9 marks)