**Phys 2102 Test II. Fall 2008**
**Time 5.15 – 6.15**

| 1 | 2 | 3 | 4 | 5 | Total |
|---|---|---|---|---|---|
| | | | | | |

| ID : | Name: |
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**Full mark: 40** **Please check that your test paper has 5 pages.**

**1.** **[8 Marks]**

**a.** In the table below write the name and the symbol for the unit of the corresponding quantities.

| | Name | Symbol |
|---|---|---|
| Magnetic field | | |
| Magnetic flux | | |
| Inductance | | |

**b.** In the table below give the correct normal unit for the corresponding quantities**.**

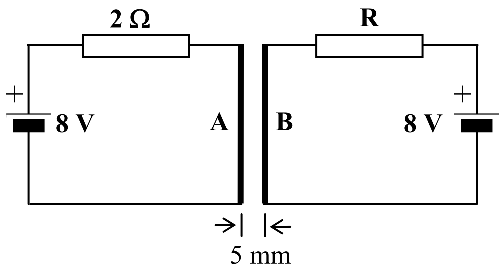
| | |
|---|---|
| $\mathbf{I_{rms} V_{rms}}$<br>(I is current and V is voltage) | |
| **Lω**<br>( L is inductance and ω is angular frequency) | |
| **qvB**<br>(q is charge, v speed and B magnetic field) | |
| **L/R**<br>(L is inductance and R resistance) | |
| $\mathcal{M}$ **x B**<br>($\mathcal{M}$ is magnetic moment and B magnetic field) | |

**2.** **[6 Marks]** Two 10 cm long parallel wires A and B are placed 5mm from each other. The wires have negligible resistance.
Wire A is connected in series with a 2 Ω resistor and an 8 V battery; wire B is connected in series with resistor of resistance R and an 8 V battery as shown in the figure.

**a.** Find the current in wire A

**b.** What should be the value of the resistance R so that the force between the two wires is $1.28 \times 10^{-5}$ N?

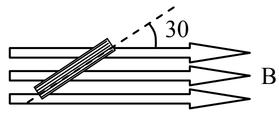
**c.** Draw on the figure the direction of the force on each wire.



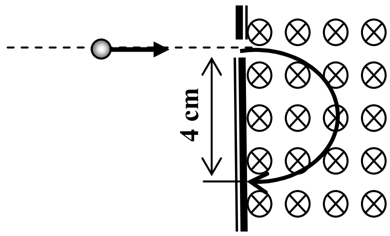
**3.** **[8 Marks]** A 200 turns square coil of side 1 cm and resistance 2 Ω is placed in a uniform magnetic field of 2T. The plane of the coil makes an angle of 30 degrees with the direction of the field.

**a.** Calculate the magnetic flux trough the coil.

**b.** The coil is rotated counter clockwise so that the plane of the coil becomes perpendicular to the direction of the field. If this rotation is completed in 5 ms what is the induced current in the coil during the rotation.



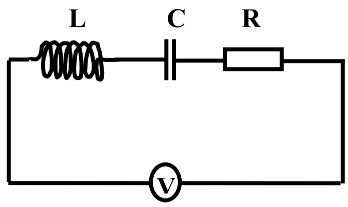
**4.** **[6 Marks]** A charged particle of mass 2 X $10^{-6}$ kg is moving with velocity $v = 0.1\ ms^{-1}$. The particle enters a region of uniform magnetic field of 2 T directed perpendicular to the velocity. The path of the particle in the field is as shown in the figure.




**a.** What is the sign of the charge on the particle?

**b.** The particle hits the plate at a distance of 4 cm from the point of entry. What is the charge of the particle?

**5.** [12 Marks] An LRC circuit is connected in series to a 90 $V_{rms}$, 4 kHz A C voltage source. The values of the components in the circuit are R = 100 Ω, C = 2 μF and L = 3 mH.




**a.** Find the impedance of the circuit.
**b.** Calculate the phase difference between the voltage and the current in the circuit.
**c.** Calculate the power factor of the circuit.
**d.** Calculate the resonance frequency of the circuit.
**e.** The frequency of the source is changed and made equal to the resonance frequency. What is the voltage across the resistor?
**f.** At resonance, what is the average power dissipated in the resistor?