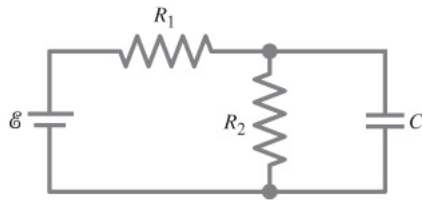


PHY114 S09 Practice Exam

S. G. Rajeev

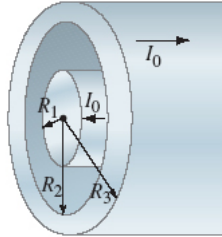
March 6 2009

1. Two $7.0\text{ k}\Omega$ resistors are placed in series and connected to a battery. A voltmeter reads 1.6 V when placed across either resistor. What is the e. m. f. of the battery? What would be the current on each resistor if they were connected in parallel to the same battery?
2. Determine the time constant for charging the capacitor in the circuit .



3. What is the minimum speed of a beam of electrons that goes undeflected when passing through perpendicular electric and magnetic fields of magnitude 6800 Vm^{-1} and $6.6 \times 10^{-3}\text{ T}$, respectively?
4. Alpha particles of charge $2e$ and mass $6.6 \times 10^{-27}\text{ kg}$ are emitted from a radioactive source at a speed of $1.8 \times 10^7\text{ ms}^{-1}$. If a magnetic field is applied perpendicular to the direction in which they are emitted, what should be its strength, in required to bend them into a circular path of radius 0.18 m ?

5. Suppose the current in the coaxial cable is not uniformly distributed, but instead the current density varies linearly with distance from the center: $j_1 = C_1 r$ for the inner conductor $j_2 = C_2 r$ and for the outer conductor. Each conductor still carries the same total current I_0 in opposite directions. Determine the magnetic field at a distance r from the axis for $r < R_1$, for $R_1 < r < R_2$ and for $r > R_2$.



6. Two long parallel wires 8.20cm apart carry 16.5A-currents in the same direction. Determine the magnetic field vector at a point 12.0 cm from one wire and 13.0 cm from the other.
7. A horizontal wire carries a large current. A second wire carrying a current in the same direction is suspended below it. Can the current in the upper wire hold the lower wire in suspension against gravity? Under what conditions will the lower wire be in equilibrium?
8. Two particles with the same electric charge q are moving in the same direction with the same velocity v . The separation between the charges is r . What is the force that one exerts on the other?