

系所別:

太空科學研究所

科目:

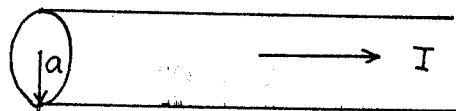
電磁學

1. A positive point charge Q is at the center of a spherical dielectric shell of an inner radius R_i and an outer radius R_o . The permittivity of the shell is ϵ . Determine electric field \vec{E} and potential V as functions of the radial distance R . (20%)

2. A large parallel-plate capacitor with uniform surface charge σ on the upper plate and $-\sigma$ on the lower is moving with a constant speed v , as shown in figure. (30%)
- Find the magnetic field between the plates and also above and below them.
 - Find the magnetic force per unit area on the upper plate, including its direction.
 - At what speed v would the magnetic force balance the electrical force?



3. A steady current I flows down a long cylindrical wire of radius a as shown in the figure. Find the magnetic field, both inside and outside the wire, if (15%)
- The current is uniformly distributed over the outside surface of the wire.
 - The current is distributed in such a way that J is proportional to s , the distance from the axis.



參考用

4. State the Maxwell's equations in the differential and integral forms. (15%)

5. What are: (20%)
- Poynting theorem
 - "Electric dipole" and "dipole moment vector"
 - Static electric field
 - Biot-Savart law