

M02E.2—Dielectric Cylinder in an Electric Field

Problem

A cylinder of radius a and dielectric constant ϵ is placed along the z -axis in a electric field, whose form is $\mathbf{E}_i = E_0\hat{\mathbf{x}} + E_1[(x/a)\hat{\mathbf{x}} - (y/a)\hat{\mathbf{y}}]$ *before* the cylinder is placed in the field. Give expressions for the total electric field \mathbf{E} , the displacement field \mathbf{D} and the polarization density \mathbf{P} everywhere.