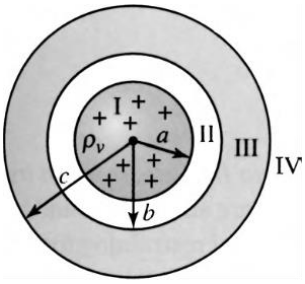
IIITDM Kancheepuram

PH1000, Assignment-1, Max. Marks: 10

1. Find the electric field a distance z above the center of a flat circular disk of radius R that carries a uniform surface charge σ. What does your formula give in the limit R→∞? Also check the case z >> R.

2. Consider a sphere of radius R containing a charge Q (uniformly distributed). Calculate the work done to assemble these charges.

3. Charge is uniformly distributed within a spherical region of radius a. An isolated conducting spherical shell with inner radius b and outer radius c is placed concentrically, as shown in Figure. Determine the electric field intensity everywhere in the region.



4. A sphere of radius R carries a polarization **P**(r) = *k***r**, where *k* is a constant and **r** is the vector from the centre. Calculate the bound charges and find the field inside and outside the sphere.

5. Find the total volume bound charge density and surface bound charge density of a dielectric cube of side a = 2 units, centered at the origin, carries a polarization $P = 6r$.

6. Find the relative permittivity of the dielectric material present in a parallel-plate capacitor if: (*a*) $A = 0.12\ \text{m}^2$, $d = 80\mu\text{m}$, $V_0 = 12$ V, and the capacitor contains 1μJ of energy; (*b*) the stored energy density is $100\ \text{J/m}^3$, $V_0 = 200$ V, and $d = 45\mu\text{m}$; (*c*) $E = 200$ kV/m and $\sigma = 20\mu\text{C/m}^2$.