

4.3

$$\rho = 20R^2 \cos^2 \theta \text{ (mC / m}^3\text{)}$$

$$Q = \int \rho dV = \iiint_{\substack{R \leq 2 \\ \theta \leq \pi/4}} 20R^2 \cos^2 \theta (R^2 \sin \theta dR d\theta d\phi) = 40\pi \int_0^2 R^4 dR \int_0^{\pi/4} \cos^2 \theta \sin \theta d\theta$$

$$Q = 40\pi \left[\frac{R^5}{5} \right]_0^2 \left[-\frac{\cos^3 \theta}{3} \right]_0^{\pi/4} = 40\pi \left[\frac{32}{5} \right] \frac{1}{3} \left[-\left(\frac{1}{\sqrt{2}} \right)^3 + 1 \right] = 173mC$$

$$Q = 0.173C$$