**Problem 4.45**  Apply the result of Problem 4.44 to find the resistance of a 20-cm-long hollow cylinder (Fig. P4.45) made of carbon with $\sigma = 3 \times 10^4$ (S/m).

![Figure P4.45](image)

**Figure P4.45:** Cross-section of hollow cylinder of Problem 4.45.

**Solution:** From Problem 4.44, we know that for two concentric cylinders,

$$ R = \frac{l}{\pi (\sigma_1 a^2 + \sigma_2 (b^2 - a^2))} \text{ (}\Omega\text{)}. $$

For air $\sigma_1 = 0$ (S/m), $\sigma_2 = 3 \times 10^4$ (S/m); hence,

$$ R = \frac{0.2}{3\pi \times 10^4((0.03)^2 - (0.02)^2)} = 4.2 \text{ (m}\Omega\text{)}. $$