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).

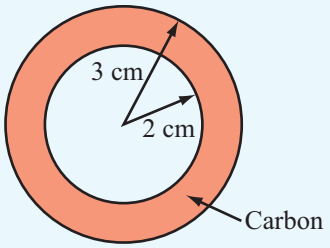

Figure P4.45 Cross-section of hollow cylinder of Problem 4.45.

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

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

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

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