

Problem 4.53 Use the result of Problem 4.52 to determine the capacitance for each of the following configurations:

- (a) conducting plates are on top and bottom faces of rectangular structure in Fig. 4-35(a) (P4.53(a)),

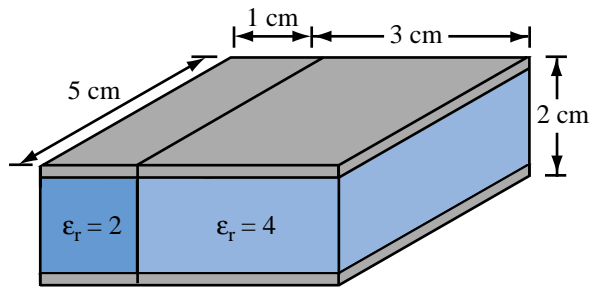
Solution:

- (a) The two capacitors share the same voltage; hence they are in parallel.

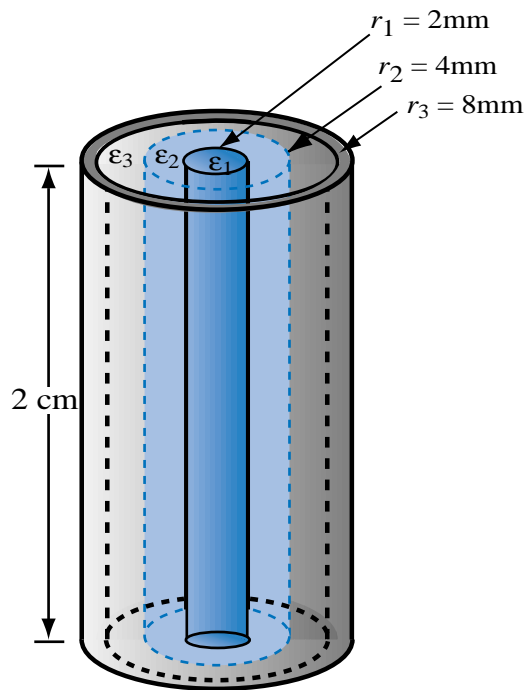
$$C_1 = \epsilon_1 \frac{A_1}{d} = 2\epsilon_0 \frac{(5 \times 1) \times 10^{-4}}{2 \times 10^{-2}} = 5\epsilon_0 \times 10^{-2},$$

$$C_2 = \epsilon_2 \frac{A_2}{d} = 4\epsilon_0 \frac{(5 \times 3) \times 10^{-4}}{2 \times 10^{-2}} = 30\epsilon_0 \times 10^{-2},$$

$$C = C_1 + C_2 = (5\epsilon_0 + 30\epsilon_0) \times 10^{-2} = 0.35\epsilon_0 = 3.1 \times 10^{-12} \text{ F.}$$



(a)



$$\epsilon_1 = 8\epsilon_0; \epsilon_2 = 4\epsilon_0; \epsilon_3 = 2\epsilon_0$$

(b)

Figure P4.53: Dielectric sections for Problems 4.53 and 4.55.