

4.53 Determine the force of attraction in a parallel-plate capacitor with $A = 5 \text{ cm}^2$, $d = 2 \text{ cm}$, and $\epsilon_r = 4$ if the voltage across it is 50 V .

Solution: From Eq. (4.131),

$$\mathbf{F} = -\hat{\mathbf{z}} \frac{\epsilon A |\mathbf{E}|^2}{2} = -\hat{\mathbf{z}} 2\epsilon_0 (5 \times 10^{-4}) \left(\frac{50}{0.02} \right)^2 = -\hat{\mathbf{z}} 55.3 \times 10^{-9} \quad (\text{N}).$$
