

376.

**Problem 31.43 (RHK)**

*An air-filled parallel-plate capacitor has a capacitance of 1.32 pF. The separation of the plates is doubled and wax is inserted between them. The new capacitance is 2.57 pF. We have to find the dielectric constant of the wax.*

**Solution:**

It is given that an air-filled parallel-plate capacitor has capacitance  $C = 1.32 \text{ pF}$ .

When the separation between the plates is doubled, the capacitance of the capacitor will change to

$$C' = \frac{C}{2} = \frac{1.32 \text{ pF}}{2} = 0.66 \text{ pF}.$$

It is given that now when wax is inserted between the plates of the capacitor its capacitance changes to

$$C'' = 2.57 \text{ pF}.$$

We know that when material with dielectric constant  $\kappa$  is inserted inside a capacitor the relation between the capacitances is

$$C'' = \kappa C'.$$

Therefore,

$$\kappa = \frac{2.57}{0.66} = 3.89.$$

