

Ch. 16 Prob. 36

Capacitor charges at $I = 0.010 \frac{C}{s}$

Find The magnetic field at $r = 10 \text{ cm}$ from The capacitor.

The magnetic field acts as if There was a wire replacing the capacitor. From Ampere's law

$$\oint \vec{B} \cdot d\vec{s} = \mu_0 I$$

$$B \oint ds = \mu_0 I$$

$$B 2\pi r = \mu_0 I \quad \therefore B = \frac{\mu_0 I}{2\pi r}$$

$I = I_d$ is the displacement current given in the problem

$$\text{So. } B = \frac{\mu_0 I_d}{2\pi r} = \frac{(4\pi \times 10^{-7} \frac{Tm}{A})(0.010 \frac{C}{s})}{2\pi (0.10 \text{ m})}$$

$$B = 2.0 \times 10^{-8} \text{ T}$$

$$B = \boxed{20 \text{ nT}}$$