Chapter 18
Maxwell's Equations and Electromagnetic Waves
18.1 Maxwell's Equations/Electomagnetic Waves   Homework #150

Maxwell's Equations
I

01. List Maxwell's four equations describing electric and magnetic fields.

02. Two square plates of a capacitor, 2.50 cm on a side, are charging causing the electric field between to increase at a rate of 3.0×10^6 V/m•s. Calculate the displacement current I_D of the capacitor.

03. A capacitor that has square parallel plates that are 1.75 cm on a side discharging via a wire connecting the two plates. If the current in the wire is 2.85 A, at what rate is the electric field changing between the plates?
II

04. A 4.35-μF capacitor has two parallel circular plates that have a radius of 1.25 cm. The capacitor is being charged such that the plates are accumulating charge at the rate of 37.5 mC/s. What is the strength of the magnetic field at a location 9.00 cm radially away from the center of the plates?

05. Show that the displacement current through a parallel-plate capacitor can be described by $I_D = C(dV/dt)$, where V is the voltage on the capacitor at a given instant.

Electromagnetic Waves
I

06. An EM wave has a magnetic field peak of 1.35×10^{-11} T. What is the peak value of the electric field in the wave?

07. An EM wave is traveling south. Its E field oscillates horizontally (west and east) at 0.135 MHz with an rms strength of 4.25 V/m.
   a.) What is the frequency of the magnetic field oscillations in this wave?
   b.) What is the rms strength of the magnetic field oscillations in this wave?
   c.) What is the peak strength of the magnetic field oscillations in this wave?
   d.) What is the direction of the oscillations of magnetic field in this wave?

For problems involving calculations related to the EM spectrum see **in "Chapter 20-Light: Wave Nature"**

ANSWERS: **02.** 1.66×10^{-8} A   **03.** -1.05×10^{15} V/m•s   **04.** 8.33×10^{-8} T   **06.** 4.05×10^{-3} V/m
07. a.) 0.135 MHz   b.) 1.42×10^{-8} T   c.) 2.00×10^{-8} T   d.) vertically up and down