61. (a) At any instant the displacement current i_d in the gap between the plates equals the conduction current i in the wires. Thus $i_{\max} = i_{d\max} = 7.60\ \mu$A.

(b) Since $i_d = \varepsilon_0\,(d\Phi_E/dt)$,

$$\left(\frac{d\Phi_E}{dt}\right)_{\max} = \frac{i_{d\max}}{\varepsilon_0} = \frac{7.60\times10^{-6}\,\text{A}}{8.85\times10^{-12}\ \text{F/m}} = 8.59\times10^5\ \text{V}\cdot\text{m/s}.$$

(c) According to problem 13,

$$i_d = C\frac{dV}{dt} = \frac{\varepsilon_0 A}{d}\frac{dV}{dt}.$$

Now the potential difference across the capacitor is the same in magnitude as the emf of the generator, so $V = \varepsilon_m \sin \omega t$ and $dV/dt = \omega\varepsilon_m \cos \omega t$. Thus, $i_d = (\varepsilon_0 A\omega\varepsilon_m / d)\cos\omega t$ and $i_{d\max} = \varepsilon_0 A\omega\varepsilon_m / d$. This means

$$d = \frac{\varepsilon_0 A\omega\varepsilon_m}{i_{d\max}} = \frac{(8.85\times10^{-12}\ \text{F/m})\pi(0.180\ \text{m})^2(130\,\text{rad/s})(220\ \text{V})}{7.60\times10^{-6}\ \text{A}} = 3.39\times10^{-3}\ \text{m},$$

where $A = \pi R^2$ was used.

(d) We use the Ampere-Maxwell law in the form $\oint \vec{B}\cdot d\vec{s} = \mu_0 I_d$, where the path of integration is a circle of radius r between the plates and parallel to them. I_d is the displacement current through the area bounded by the path of integration. Since the displacement current density is uniform between the plates, $I_d = (r^2/R^2)i_d$, where i_d is the total displacement current between the plates and R is the plate radius. The field lines are circles centered on the axis of the plates, so $\vec{B}$ is parallel to $d\vec{s}$. The field has constant magnitude around the circular path, so $\oint \vec{B}\cdot d\vec{s} = 2\pi rB$. Thus,

$$2\pi rB = \mu_0\left(\frac{r^2}{R^2}\right)i_d \quad\Rightarrow\quad B = \frac{\mu_0 i_d r}{2\pi R^2}.$$

The maximum magnetic field is given by

$$B_{\max} = \frac{\mu_0 i_{d\max} r}{2\pi R^2} = \frac{(4\pi\times10^{-7}\ \text{T}\cdot\text{m/A})(7.6\times10^{-6}\ \text{A})(0.110\text{m})}{2\pi(0.180\,\text{m})^2} = 5.16\times10^{-12}\ \text{T}.$$