1.(a) $\vec{E}_1 = \hat{y}E_o \exp[i(\hat{z}+\hat{x})k\cdot\vec{r}/\sqrt{2}-\omega t)]$ $\quad$ $\vec{E}_2 = \hat{y}E_o \exp[i(\hat{z}-\hat{x})k\cdot\vec{r}/\sqrt{2}-\omega t)]$
$\vec{B}_1 = \vec{k}_1 \times \vec{E}_1/\omega = (-\hat{x}+\hat{z})(E_o/\sqrt{2}c)\exp[i(\hat{z}+\hat{x})k\cdot\vec{r}/\sqrt{2}-\omega t)]$
$\vec{B}_2 = \vec{k}_2 \times \vec{E}_2/\omega = (-\hat{x}-\hat{z})(E_o/\sqrt{2}c)\exp[i(\hat{z}-\hat{x})k\cdot\vec{r}/\sqrt{2}-\omega t)]$
(b) $\vec{\overline{S}} = \text{Re }(\vec{E}_1+\vec{E}_2)\times(\vec{B}_1+\vec{B}_2)^*/2\mu_o$
$= \text{Re }(2E_o)\hat{y}\cos(kx/\sqrt{2})\exp[i(kz/\sqrt{2}-\omega t)]$
$\times(2E_o/\sqrt{2}c)\{-\hat{x}\cos(kx/\sqrt{2})-i\hat{z}\sin(kx/\sqrt{2})\}\exp[-i(kz/\sqrt{2}-\omega t)]/2\mu_o$
$= \hat{z}(\sqrt{2}E_o^2/Z_o)\cos^2(kx/\sqrt{2})$ with $Z_o = \sqrt{\mu_o/\epsilon_o}$

2.(a) $\vec{E}_o = V/d$
(b) $B_o = k/\omega\hat{z}\times\vec{E}_o = -\hat{x}V/dc$
(c) B.C. at conductor surface: $K = \Delta H = V/(dc\mu_o)$
(In the $\hat{z}$ direction for the positive conductor and the $-\hat{z}$ direction for the negative conductor.)
$I = K\ w = wV/(dc\mu_o)$
(d) $Z_c = V/I = (d/w)\ c\mu_o = (d/w)Z_o$ with $Z_o = \sqrt{\mu_o/\epsilon_o}$.

3.(a) Flux in the loop: $\Phi = B_o\cos(\omega t)\pi R^2$ in the $+z$ direction. The EMF produced will be $E = -d\Phi/dt = B_o\omega\sin(\omega t)$. It will be in a direction to oppose the change in the flux with the current it is producing. At $\omega t = \pi/6$ we have $\cos(\pi/6)$ decreasing, so that $\sin(\pi/6)$ positive, indicating generating flux in $+z$-direction. This implies current will be in the $+\hat{\phi}$ direction.
(b) $-\partial\vec{B}/\partial t = \nabla\times\vec{E} = \nabla\times 2\hat{x}\sin(\omega t+\pi y) = -2\hat{z}\ \partial/\partial y\ \sin(\omega t+\pi y) = -2\pi\hat{z}\cos(\omega t+\pi y)$
$\vec{B} = 2\pi\hat{z}\sin(\omega t+\pi y)/\omega$ $\qquad$ $\vec{H} = 2\pi\hat{z}\sin(\omega t+\pi y)/(\omega\mu_o)$