SOLUTION

$$\vec{B} = (0 | 0 | B_z) \qquad \vec{E} = (E_x | E_y | 0)$$

$$\vec{B} \cdot \vec{E} = 0 \qquad \vec{E} \times \vec{B} = (E_y B_z | -E_x B_z | 0)$$

$$j_z = 0$$

$$j_x = \sigma_0 \left[(1 - \mu^2 B_z^2) E_x - \mu B_z E_y \right]$$

$$j_y = \sigma_0 \left[(1 - \mu^2 B_z^2) E_y + \mu B_z E_x \right] = 0$$

$$\rightarrow \quad E_x = - \frac{1 - \mu^2 B_z^2}{\mu B_z} E_y$$

$$\rightarrow \quad j_x = - \sigma_0 \left[\frac{(1 - \mu^2 B_z^2)^2}{\mu B_z} + \mu B_z \right] E_y$$

$$E_y = - \left(\frac{j_x}{\sigma_0} \right) \left[\frac{1}{(1 - \mu^2 B_z^2)^2 \frac{1}{\mu B_z} + \mu B_z} \right]$$

$$= - \left(\frac{j_x}{\sigma_0} \right) \mu B_z \frac{1}{(1 - \mu^2 B_z^2)^2 + \mu^2 B_z^2}$$

to sec. order in B:

$$E_y = - \left(\frac{j_x}{\sigma_0} \right) \mu B_z$$

$$E_x = + \frac{1-\mu^2 B_z^2}{\cancel{\mu B_z}} \left(\frac{j_x}{\sigma_0}\right) \cancel{\mu B_z} \frac{1}{(1-\mu^2 B_z^2)^2 + \mu^2 B_z^2}$$

$$= \left(\frac{j_x}{\sigma_0}\right) \frac{1}{(1-\mu^2 B_z^2) + \frac{\mu^2 B_z^2}{1-\mu^2 B_z^2}}$$

$$= \left(\frac{j_x}{\sigma_0}\right) \frac{1}{1-\mu^2 B_z^2 + \mu^2 B_z^2 (1+\mu^2 B_z^2)}$$

$$= \left(\frac{j_x}{\sigma_0}\right) \frac{1}{1 + (\mu^2 B_z^2)^2} \underset{\uparrow}{\approx} \left(\frac{j_x}{\sigma_0}\right)$$

to sec. order in B_z

Numbers: $\frac{j_x}{\sigma_0} = \frac{I_x}{L} R_0 \quad \left(= \frac{I_x}{Wd} \frac{R_0 W d}{L} \right)$

$$= 200 \frac{V}{cm}$$

$\rightarrow \underline{V_x} = -E_x L = \underline{-200V}$

$\underline{V_y} = -E_y W = \frac{j_x}{\sigma_0} \mu B_z W = \underline{3.2V}$