(b) We need to settle C_1, C_2, and γ in our $B(y)$.

We know that $B_{1\perp} = B_{2\perp}$ at $y=0$ and $y=b$, but that doesn't help much since $B_\perp = 0$ always.

What about $E_\parallel$? Since $E=0$ in the conductor, the continuity of $E_\parallel$ means the $\hat{k}$ component of E evaluated at $y=0$ or $y=b$ must give 0. Therefore:

$$B'(0) = B'(b) = 0 \Rightarrow \gamma C_1 \cos(0) - \gamma C_2 \sin(0) = 0$$

$$\Rightarrow C_1 = 0$$

Evaluated at b: $-\gamma C_2 \sin(\gamma b) = 0$

$$\Rightarrow \gamma b = n\pi, \text{ integer } n$$

$$\Rightarrow \gamma = \frac{n\pi}{b}$$

Which allows us to get a complete $B(y)$ of $B_0 \cos\left(\frac{n\pi y}{b}\right)$, full E+B fields, and the dispersion relation:

$$\vec{B} = B_0 \cos\left(\frac{n\pi y}{b}\right) e^{i(kz-\omega t)}\,\hat{\imath}$$

$$\vec{E} = -\frac{c^2 k}{\omega} \cdot B_0 \cos\left(\frac{n\pi y}{b}\right) e^{i(kz-\omega t)}\,\hat{\jmath} + \frac{n\pi c^2}{ib\omega} B_0 \sin\left(\frac{n\pi y}{b}\right) e^{i(kz-\omega t)}\,\hat{k}$$

$$\frac{n\pi}{b} = \sqrt{\omega^2/c^2 - k^2}$$

(taking the real parts, of course)

Next we use the other two boundary conditions to find $\sigma + \vec{K}$:

$E_{1\perp} - E_{2\perp} = \sigma/\varepsilon_0$ $(E_{2\perp} = 0)$ gives (at $y=0$ or $y=b$)

$$-\frac{c^2 k}{\omega} B_0 \cos\left[\frac{n\pi}{b}(b \text{ or } 0)\right] e^{i(kz-\omega t)} = \sigma/\varepsilon_0$$

$$\Rightarrow \sigma = \frac{-c^2 k \varepsilon_0}{\omega} B_0 \cos(kz-\omega t) \quad \text{at } y=0$$

$$= -\frac{c^2 k \varepsilon_0}{\omega} B_0 \cos(n\pi)\cos(kz-\omega t) \quad \text{at } y=b$$

$\left(\cos(n\pi) = 1 \text{ for even } n, -1 \text{ for odd}\right)$

Similarly, $\vec{B}_{1\parallel} - \vec{B}_{2\parallel} = \mu_0 \vec{K} \times \hat{n}$ gives our surface current:

$$B_0 \cos(kz-\omega t)\hat{\imath} = \mu_0 \vec{K} \times \hat{\jmath} \quad (\text{for } y=0)$$

$$\Rightarrow \quad \vec{K} = -\frac{B_0}{\mu_0}\cos(kz-\omega t)\hat{k}$$

Also $\quad B_0 \cos(n\pi)\cos(kz-\omega t)\hat{\imath} = \mu_0 \vec{K} \times (-\hat{\jmath})$ (for $y=b$, note $\hat{n}$ becomes $-\hat{\jmath}$ instead of $\hat{\jmath}$)

$$\Rightarrow \quad \vec{K} = +\frac{B_0}{\mu_0}\cos(kz-\omega t)\hat{k} \quad \text{if } n \text{ is even}$$

$$-B_0/\mu_0 \cos(kz-\omega t)\hat{k} \quad \text{if } n \text{ is odd}$$