$$H_{z1} = A_1 \cos(k_{x1} x) e^{-jk_z z}$$

$$H_{z2} = A_2 \cos(k_{x_2} x) e^{-jk_z z}$$

$$E_x = \frac{-j}{K^2}\left(k_z \frac{\partial}{\partial x} E_z + \omega\mu \frac{\partial}{\partial y} H_z\right)$$

$$E_y = \frac{-j}{K^2}\left(k_z \frac{\partial}{\partial y} E_z + \omega\mu \frac{\partial}{\partial x} H_z\right)$$

$$H_x = \frac{-j}{K^2}\left(k_z \frac{\partial}{\partial x} H_z + \omega\mu \frac{\partial}{\partial y} E_z\right)$$

$$H_y = \frac{-j}{K^2}\left(k_z \frac{\partial}{\partial y} H_z + \omega\mu \frac{\partial}{\partial x} E_z\right)$$

$$k_{x_1}^2 + k_z^2 = k_1^2 = \omega^2 \varepsilon_1 \mu_0$$

$$-k_{x2}^2 + k_z^2 = k_2^2 = \omega^2 \varepsilon_2 \mu_0$$

$$K = k^2 - k_z^2$$

$$k^2 = k_x^2 + k_y^2 + k_z^2$$

$$K = (k_x^2 + k_y^2 + k_z^2) - k_z^2$$

1: $K_1 = k_1^2 - k_{z1}^2 = k_{x1}^2 + k_{z1}^2 - k_{z1}^2 \underline{= k_{x_1}^2}$

$$E_x = \frac{-j}{k_{x1}^2}\left(\cancel{k_z \frac{\partial}{\partial x} E_z} + \omega\mu \frac{\partial}{\partial y} H_z\right) \Rightarrow \frac{-j}{k_{x1}^2} \omega\mu\, 0 = \underline{0}$$

$$E_y = \frac{-j}{k_{x1}^2}\left(\cancel{k_z \frac{\partial}{\partial y} E_z} + \omega\mu \frac{\partial}{\partial x} H_z\right) = -\frac{j}{k_{x1}^2} \omega\mu A_1 \sin(k_{x1} x) k_{x1} e^{-jk_z z}$$

$$= \underline{\frac{-j}{k_{x1}} \omega\mu A_1 \sin(k_{x1} x) k_{x1} e^{-jk_z z}}$$

$$H_x = \frac{-j}{k_{x1}^2}\left(k_z \frac{\partial}{\partial x} H_z + \cancel{\omega\mu \frac{\partial}{\partial y} E_z}\right) = \underline{\frac{-j}{k_{x1}} k_z \omega\mu A_1 \sin(k_{x1} x) k_{x1} e^{-jk_z z}}$$

$$H_y = \frac{-j}{k_{x1}^2}\left(k_z \frac{\partial}{\partial y} H_z + \cancel{\omega\mu \frac{\partial}{\partial x} E_z}\right) = \underline{0}$$

2: