ΠΕΔΙΑ Α 10/09/2008

Θεμα 1

(α)

$$\vec{E} = E_x\hat{i}_x + E_y\hat{i}_y$$

$$E_x = \frac{\lambda}{2\pi\epsilon_0}\left(\frac{x}{x^2+(y-d)^2} - \frac{x}{x^2+(y+d)^2}\right)$$

$$E_y = \frac{\lambda}{2\pi\epsilon_0}\left(\frac{y-d}{x^2+(y-d)^2} - \frac{y+d}{x^2+(y+d)^2}\right)$$

(β)

$$\vec{E} \simeq \frac{\lambda}{2\pi\epsilon_0}\frac{2d}{r_T^2}\left(\sin 2\phi\hat{i}_x - \cos 2\phi\hat{i}_y\right)$$

$$\text{x-axis:} \quad \vec{E} \simeq \frac{\lambda}{2\pi\epsilon_0}\frac{2d}{r_T^2}(-\hat{i}_y)$$

$$\text{y-axis:} \quad \vec{E} \simeq \frac{\lambda}{2\pi\epsilon_0}\frac{2d}{r_T^2}(+\hat{i}_y)$$

$$\text{y = +x:} \quad \vec{E} \simeq \frac{\lambda}{2\pi\epsilon_0}\frac{2d}{r_T^2}(+\hat{i}_x)$$

$$\text{y = -x:} \quad \vec{E} \simeq \frac{\lambda}{2\pi\epsilon_0}\frac{2d}{r_T^2}(-\hat{i}_x)$$

(γ)

$$\vec{E} \simeq \frac{\lambda}{2\pi\epsilon_0}\frac{8d^2}{r_T^3}\left(-\sin 2\phi\cos\phi\hat{i}_x + \cos 2\phi\cos\phi\hat{i}_y\right)$$

$$\text{x-axis:} \quad \vec{E} \simeq \frac{\lambda}{2\pi\epsilon_0}\frac{8d^2}{r_T^3}(+\hat{i}_y)$$

$$\text{y-axis:} \quad \vec{E} \simeq 0$$

$$\text{y = +x:} \quad \vec{E} \simeq \frac{\lambda}{2\pi\epsilon_0}\frac{8d^2}{r_T^3}(-\frac{\sqrt{2}}{2}\hat{i}_x)$$

$$\text{y = -x:} \quad \vec{E} \simeq \frac{\lambda}{2\pi\epsilon_0}\frac{8d^2}{r_T^3}(+\frac{\sqrt{2}}{2}\hat{i}_x)$$

Θεμα 2

(α)

$$\vec{H} = \frac{I}{D}\hat{i}_z \qquad \text{for } -(x_0+d) < x < x_0 \text{ and } 0 < y < a$$

(β)

$$\nabla^2 H_z = \frac{\partial^2 H_z}{\partial x^2} + \frac{\partial^2 H_z}{\partial y^2} = 0$$

(γ)

$$\begin{aligned}
H_z &= H_z(x) \qquad \text{for } x_0 < x < x_0 + d \text{ and } 0 < y < a \\
\vec{H} &= \left[-\frac{I}{Dd}x + \frac{I}{D}(1 + \frac{x_0}{d}) \right] \hat{i}_z \\
\vec{J} &= \left[\frac{I}{Dd} \right] \hat{i}_y \\
\vec{E} &= \left[\frac{I}{Dd\sigma} \right] \hat{i}_y \\
\vec{K}(y = a) &= \left[\frac{I}{Dd}x - \frac{I}{D}(1 + \frac{x_0}{d}) \right] \hat{i}_x \\
\vec{K}(y = 0) &= \left[-\frac{I}{Dd}x + \frac{I}{D}(1 + \frac{x_0}{d}) \right] \hat{i}_x
\end{aligned}$$

$\underline{\Theta\epsilon\mu\alpha \;\; 3}$

(α)

Reflected Wave: $\vec{E}_r = -E_0(\hat{i}_x - j\hat{i}_y)\exp(+jk_0 z)$

Incident Wave Polarization: *Right-Handed Circular Polarization*

Reflected Wave Polarization: *Left-Handed Circular Polarization*

(β)

$$\vec{\mathcal{E}} = 2E_0 \sin k_0 z \sin \omega t \;\; \hat{i}_x - 2E_0 \sin k_0 z \cos \omega t \;\; \hat{i}_y$$

(γ)

$$\begin{aligned}
\vec{\mathcal{K}} &= \frac{2E_0}{Z_0} \left[\hat{i}_x \cos \omega t + \hat{i}_y \sin \omega t \right] \\
Z_0 &= \sqrt{\mu_0/\epsilon_0}
\end{aligned}$$

(δ)

$$\begin{aligned}
\vec{f} &= \vec{f}_e + \vec{f}_m \\
\vec{f}_e &= 0 \\
\langle \vec{f}_e \rangle &= 0
\end{aligned}$$

$$
\begin{aligned}
\vec{f}_m &= \frac{2E_0^2\mu_0}{Z_0^2}\hat{i}_z \\
\langle\vec{f}_m\rangle &= \frac{2E_0^2\mu_0}{Z_0^2}\hat{i}_z \\
\langle\vec{f}\rangle &= \frac{2E_0^2\mu_0}{Z_0^2}\hat{i}_z
\end{aligned}
$$