Problema 3 da 1ª lista.

$$\vec{E} = (40 - j30)\, e^{-j20z}\, \hat{a}_x \quad V/m.$$

a) ω ; b) β ; c) f ; d) λ e) $\vec{H}(z,t)$ em $P(6; -1; 0{,}7)$.

$$\vec{e}(x,y,z,t) = Re\left(\vec{E}\, e^{j(\omega t - \vec{K}\cdot\vec{r})}\right)$$

$$\vec{E} = E_x \hat{a}_x + E_y \hat{a}_y + E_z \hat{a}_z$$

$$\vec{E} = E_x \hat{a}_x$$

$$\vec{K} = k_x \hat{a}_x + k_y \hat{a}_y + k_z \hat{a}_z$$

$$\vec{r} = x\hat{a}_x + y\hat{a}_y + z\hat{a}_z$$

$$\vec{K}\cdot\vec{r} = k_x x + k_y y + k_z z.$$

$$k_z = 20$$

a) $k_z = \omega\sqrt{\mu_0\varepsilon_0} = \dfrac{\omega}{c}$

$$\boxed{\omega = c \cdot 20}$$

b) $\beta \equiv k_z = 20$ rad/m

c) $\omega = 2\pi f \rightarrow f = \dfrac{20\,c}{2\pi}$ Hz

d) $k_z \equiv \beta = \dfrac{2\pi}{\lambda} \rightarrow \lambda = \dfrac{2\pi}{\beta}$ m

$$\vec{H}(z) = \hat{n} \times \frac{1}{\eta}\vec{E}(z) = \hat{a}_z \times \frac{1}{\eta} E_x \hat{a}_x$$

$$= \frac{1}{\eta}(40 - j30)\, e^{-j20z}\, \hat{a}_y$$

$$\vec{h}(z,t) = Re\left\{\frac{1}{\eta}(40 - j30)\, e^{j(\omega t - 20z)}\hat{a}_y\right\}$$

$$= \frac{1}{\eta}\left\{\sqrt{40^2 + 30^2}\, e^{-j\tan^{-1}\frac{30}{40}}\, e^{j(20ct - 20z)}\, \hat{a}_y\right\}$$

$$\vec{h}(z,t) = Re\left\{\frac{1}{\eta}\left[\sqrt{2500}\, e^{-j\tan^{-1}\frac{3}{4}}\, e^{j(20ct - 20z)}\, \hat{a}_y\right]\right\}$$

Omdy

$$\eta = \sqrt{\frac{\mu_0}{\varepsilon_0}} = 377\ \Omega$$

$$\vec{h}(z,t) =$$

$$\frac{50}{\eta}\cos\left(20ct - 20z - \tan^{-1}\frac{3}{4}\right)\hat{a}_y$$

(0,7)