M. Masyim Abdillah P. 1101191095 TT-43-11

2. $\varepsilon_r = 4,4$ F/m $\quad f = 1\,GHz = 10^9$ Hz

$\mu_r = 1,5$ H/m

$E(x,t) = 100 \cos(\omega t - \beta z)\,\hat{a}_x$ V/m

a. $\beta = \frac{\omega}{c}\sqrt{\mu_r \varepsilon_r} = \frac{2\pi \cdot 10^9}{3\times 10^8}\sqrt{1,5 \cdot 4,4} = 53,8$

$\lambda = \frac{v}{f} = \frac{c}{f\sqrt{\mu_r \varepsilon_r}} = \frac{3\times 10^8}{10^9\sqrt{1,5 \cdot 4,4}} = 0,12$ m

$\gamma = \alpha + j\beta = 0 + j\,53,8$

$V_p = \frac{c}{\sqrt{\mu_r \varepsilon_r}} = \frac{3\times 10^8}{\sqrt{1,5 \cdot 4,4}} = 1,2 \times 10^8$ m/s

b. $\eta = 377\sqrt{\frac{\mu_r}{\varepsilon_r}} = 377\sqrt{\frac{1,5}{4,4}} = 220,12\ \Omega$

c. $H(z,t) = \frac{100}{\eta}\cos(\omega t - \beta z)\,\hat{a}_y$ A/m

$= \frac{100}{220,12}\cos(2\pi \cdot 10^9 t - 53,8z)\,\hat{a}_y$ A/m

$= 0,454\cos(2\pi \cdot 10^9 t - 53,8z)\,\hat{a}_y$ A/m

d. $P_{av} = \frac{E_0^2}{2\eta} = \frac{100^2}{2 \cdot 220,12} = 22,71$ W/m^2

e. $P(z,t) = 45,4\cos^2(2\pi \cdot 10^9 t - 53,8z)\,\hat{a}_z$ W/m^2