

FIELDS AND WAVES - QUIZ 1

SOLUTIONS TO Q 1. (32 points).

1a) If a lossless transmission line is terminated in the characteristic impedance, there are no standing waves

1) True

2) If a lossless transmission line is $1/2$ wavelength long, then the input impedance of the line is the load impedance.

2) True

3) A resistor is 6cm long. Estimate at what frequency transmission line effects start to become important.

3) Assumptions = $\boxed{v_p = c = 3 \times 10^8}$; $\boxed{\frac{l}{\lambda} = .01}$ when T-line effects come into picture.

$$\lambda = \frac{v_p}{f} \rightarrow \frac{l}{c} = 0.01$$

$$\Rightarrow f = 50 \times 10^6 \text{ Hz} = \boxed{50 \text{ MHz}}$$

4) Express $\vec{E} = E_0 \cos(\omega t - kz) \hat{a}_z$ as a phasor

4) $\vec{E} = E_0 e^{-jkz} \hat{a}_z$

5) Given the phasor $\vec{E} = -j30 \hat{a}_x + j10 \hat{a}_y$ at 10MHz. Write the expression for time domain.

5) $\vec{E} = -30 e^{j\pi/2 x} + 10 e^{j\pi/2 y}$