

Quiz #1, 09/20/2017

Name: _____ Signature: _____

A wave with the frequency of 2-MHz travels in the -z direction in air. Assume the wave travels at the speed of light ($c = 3.0 \times 10^8 \text{ m/s}$ in air). If the wave reaches a peak value of 1.2π at $z = 50 \text{ m}$ when $t = 0$. Find:

- 1) Wavelength in air
- 2) Expression for the instantaneous of the wave (time domain)
- 3) Expression for the wave in the phasor domain

Solution:

$$(1) \lambda f = c, \lambda = \frac{c}{f} = 150(m).$$

$$(2) y(z, t) = 1.2\pi \cos\left(2\pi 2 \times 10^6 t + \frac{2\pi}{\lambda} z + \phi_0\right)$$

$$y(z, t) = 1.2\pi \cos\left(\frac{2\pi}{\lambda} 50 + \phi_0\right) = 1.2\pi, \phi_0 = -\frac{2\pi}{3}$$

$$y(z, t) = 1.2\pi \cos\left(4\pi 10^6 t + \frac{2\pi}{\lambda} z - \frac{2\pi}{3}\right)$$

$$(3) \tilde{y}(z) = 1.2\pi e^{j\left(\frac{2\pi}{150}z - \frac{2\pi}{3}\right)}$$