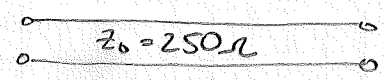
#3



$\alpha = 0.02\ dB/m$

$\ell\ 0.01\mu H/cm$

Distortionless or non-dispersive line thus

$RC = LG$, $Z_0 = \sqrt{\frac{L}{C}}$, $\alpha = \frac{R}{Z_0}$, $\beta = \omega\sqrt{LC}$

Find: R, G, C, v_p

R: $R = Z_0 \alpha$

$$R = 250\Omega\left(0.02\frac{dB}{m}\right)\left(\frac{.115\,Np}{dB}\right)$$

$$= \underline{\underline{0.575\Omega/m}}$$

C: $Z_0 = \sqrt{\frac{L}{C}} \Rightarrow 250 = \sqrt{\frac{1\mu H/m}{C}}$ $\quad .01\mu H/cm \rightarrow 1\mu H/m$

$$6.25\times10^{4}\,\Omega^2 = \frac{1\mu H/m}{C}$$

$$C = 16\times10^{-12}\ F/m \text{ or } \underline{\underline{16pF/m}}$$

G: $RC = LG$

$$(0.575\Omega/m)(16\times10^{-12}\ F/m) = (1\mu H/m)(G)$$

$$G = 9.2\times10^{-6}\ S/m$$

v_p: $v_p = \frac{\omega}{\beta} = \frac{\cancel{\omega}}{\cancel{\omega}\sqrt{LC}}$ (distortionless line, not frequency dependent)

$$= \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{1\times10^{-6}H/m \cdot 16\times10^{-12}F/m}}$$

$$= \underline{\underline{2.5\times10^{8}\ m/s}}$$