# Hint for problem 2.6

Design constraint for a distortionless line is $R'C' = G'L'$

Or equivalently, $\frac{R'}{L'} = \frac{G'}{C'}$. Call this ratio "K"

$$K = \frac{R'}{L'} = \frac{G'}{C'}$$

Look at the formula for impedance...

$$Z_0 = \sqrt{\frac{R' + j\omega L'}{G' + j\omega C'}} = \sqrt{\frac{L'\left(\frac{R'}{L'} + j\omega\right)}{C'\left(\frac{G'}{C'} + j\omega\right)}} = \sqrt{\frac{L'(K + j\omega)}{C'(K + j\omega)}} = \sqrt{\frac{L'}{C'}}$$

factored out

identify "K"

remove $\frac{1}{j}$ term

Pull the same trick on $\gamma^2$ ... (complex propation const. squared)

$$\gamma^2 = (R' + j\omega L')(G' + j\omega C') = L'\left(\frac{R'}{L'} + j\omega\right) C'\left(\frac{G'}{C'} + j\omega\right)$$

Work by yourself from here... you should find that it's easy to compute $\sqrt{\gamma^2} = \gamma$. Then $\alpha = \mathrm{Re}\{\gamma\}$, $\beta = \mathrm{Im}\{\gamma\}$