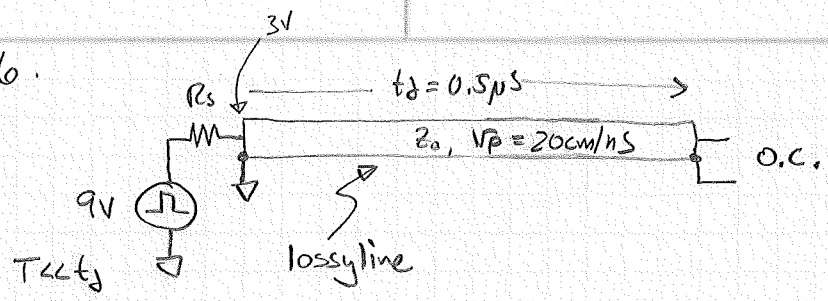
6.



$R_s = Z_0$, matched at input side

a) if pulse received back at the input, what is attenuation $\alpha = e^{-\alpha z}$?

length of cable is $20\frac{cm}{ns} \cdot 500\,ns = \underline{100 \text{ meters}}$

$$\frac{3}{9} = e^{-\alpha z (100m)}$$

$$-1.1 = -\alpha (200) m$$

$$\underline{\underline{\alpha = 5.493 \times 10^{-3} \frac{Np}{m}}}$$

b) If $\alpha = 0.01\,Np/m$, what is α in dB/m, $dB/100ft$, Np/cm

$$0.01\frac{Np}{m} \cdot \frac{8.686\,dB}{Np} = \underline{8.686 \times 10^{-2} \frac{dB}{m}}$$

$$8.686 \times 10^{-2} \frac{dB}{m} \frac{m}{3.28ft} = .0926\,dB/ft \text{ or } \underline{9.26\frac{dB}{100ft}}$$

$$0.01\frac{Np}{m} \frac{1m}{100cm} = \underline{\frac{1 \times 10^{-4} Np}{cm}}$$

c with $\alpha = 0.01 Np/m$, how much is pulse attenuated by traveling to node if the line is shortened to 50m? Express in Np, dB, + %

$$V_o/V_i = e^{-\alpha z_v}$$
$$V_o/V_i = e^{-0.01(50m)}$$
$$V_o/V_i = .6065 \qquad \underline{\text{Attenuated by } 60.65\%}$$

Attenuation in Np is $\ln(.6065) = \underline{0.5 Np}$

$$8.686\frac{dB}{Np} \cdot 0.5 Np = \underline{4.343\,dB}$$