6. Rs = Rs, making at input side.

a) If pulse received back at the input, what is attenuation \( \alpha = e^{-x^2} \)?

Length of cable is \( 20 \text{ cm} \). 500 ft = 100 meters.

\[
\frac{3}{2} \times e^{-\alpha \cdot 2(100m)}
\]

\[\alpha = -1.1 = -\alpha \cdot (200) \text{m}\]

\[
\alpha = 5.493 \times 10^{-3} \frac{N_p}{m}
\]

b) If \( \alpha = 0.01 \text{Np/m} \), what is \( \alpha \) in \( \text{dB/m}, \text{dB/100ft}, \text{Np/cm} \)?

\[
0.01 \text{Np} \cdot 8.686\text{dB} \frac{\text{dB}}{\text{Np}} = 8.686 \times 10^{-2} \text{dB/m}
\]

\[
8.686 \times 10^{-2} \text{dB/m} \cdot \frac{1}{5.28} = 1.692 \text{ dB/100ft}
\]

\[
0.01 \text{Np} \cdot \frac{1}{100 \text{cm}} = 7 \times 10^{-3} \text{Np/cm}
\]

c) With \( \alpha = 0.01 \text{Np/m} \), how much is pulse attenuated by traveling to node if the line is shortened to 50 m? Express in Np, dB, \( \%\).

\[
\frac{V_o}{V_i} = e^{-\alpha z}
\]

\[
\frac{V_o}{V_i} = e^{-0.01(50 \text{m})}
\]

\[
\frac{V_o}{V_i} = 1.6665 \quad \text{Attenuated by 60.65\%}
\]

Attenuation in Np is \( \ln (1.6665) = 0.5 \text{Np} \)

\[
8.686 \frac{\text{dB}}{\text{Np}} \cdot 0.5 \text{Np} = 4.343 \text{dB}
\]