In the circuit below, T1 is a lossless transmission line with $Z_0 = 75\Omega$, terminated with an unknown termination consisting of two passive circuit elements. Also shown are the voltage waveforms at the input (a1) and output (a2) of the transmission line.

- Incident wave was $0.5\, V$.
- Reflection was
  - $0.5 - 0.33 = -0.167\, V$
- $R_L = \frac{R_L - 75}{R_L + 75} = -0.167$
  - $0.334(R_L + 75) = R_L - 75$
  - $0.334R_L = 25.05 = R_L - 75$
  - $1.334R_L = 37.48\, \Omega$

(a) [19] Determine the lumped-element termination. Draw the terminating circuit including the lumped-element values with appropriate units. Provide a short rationale for your answer.

Final voltage asymptotic to 0 volts \(\rightarrow\) shunt inductor
Reflect wave at far end indicates a resistance less than $Z_0 \rightarrow$ shunt resistor

Determine \( T \):

\[
\begin{array}{c}
\begin{array}{c}
\overline{75} \\
\overline{37.48} \\
\overline{L}
\end{array}
\end{array}
\Rightarrow
\begin{array}{c}
\begin{array}{c}
\overline{25} \\
\overline{L_L}
\end{array}
\end{array}
\]

\[
x(t) = x(\infty) + [x(\infty) - x(\infty)] e^{-\frac{t}{\tau}}
\]

- $20.25 = 0 + [0.333 - 0] e^{-\frac{2.10^{-9}}{25}}$
- $20.25 = 0.333 e^{-\frac{5 \times 10^{-9}}{L}}$
- $4.974 = -\frac{5 \times 10^{-9}}{L} \Rightarrow L = 1 \times 10^{-7}\, H$

\[
= 100\, nH
\]