2.83 The transmission-line circuit of **Fig. P2.83** is excited by a 1 ns long pulse that starts at $t = 0$. The line is 1 m long and the phase velocity of the line is 2×10^8 m/s. Generate:

(a) a plot of the voltage across the line at $t = 6$ ns.

(b) a plot of the voltage across the line at $t = 12$ ns.

(c) a plot of the voltage as a function of time at the sending end of the line.

(d) a plot of the voltage as a function of time at the midpoint of the line.

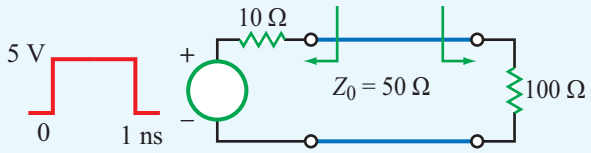

Figure P2.83 Circuit for Problem 2.83.

Solution: The one-way propagation time is

$$T = \frac{l}{u_p} = \frac{1}{2 \times 10^8} = 5 \text{ ns}.$$

The voltage reflection coefficients at the generator and load ends of the line are

$$\Gamma_g = \frac{R_g - Z_0}{R_g + Z_0} = \frac{10 - 50}{10 + 50} = -0.667,$$

$$\Gamma_L = \frac{R_L - Z_0}{R_L + Z_0} = \frac{100 - 50}{100 + 50} = 0.33.$$

Also,

$$V_1^+ = \frac{V_{01} Z_0}{R_g + Z_0} = \frac{5 \times 50}{10 + 50} = 4.167 \text{ V}.$$