6.630 Solution to Problem Set 5
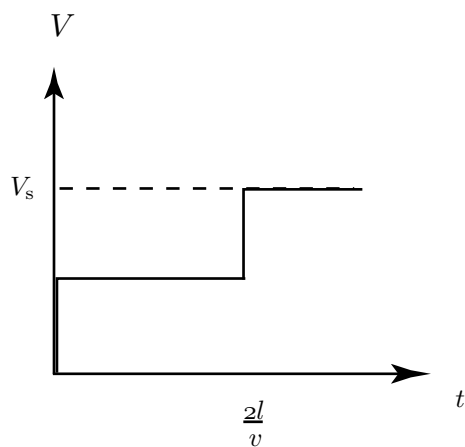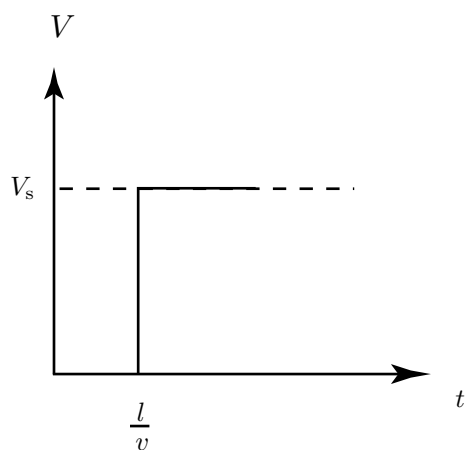
Solution P5.1

(a) $t = 2l/v = 4$ ns

(b) The signal quality at the source is poor with two separate transitions to arrive at V_s.

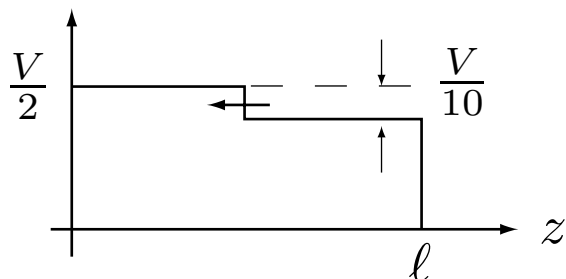(c) The signal quality at the load is good with a single transition to V_s.

Solution P5.2

(a) $V_+ = I_o Z_o/2, V_- = -I_o Z_o/2$.

(b) $\Gamma_L = V_-/V_+ = -1$.

(c) $Z_L = Z_o \frac{1+\Gamma_L}{1-\Gamma_L} = 0$.

(d) At $\omega t = \pi/2$, $V(z,t) = \mathrm{Re}\{V(z)e^{j\omega t}\} = I_o Z_o \sin kz$.

(e) $Z_s = V_s/I_{in} = Z_o$.

Solution P5.3

(a) The load of $T1$ is Z_o parallel with $2Z_o$, which is $\frac{2}{3}Z_o$. Therefore the reflection coefficient $\Gamma_L = -\frac{1}{5}$.

(b) The input impedance of $T3$ is zero since its length is $\lambda/2$ and its load is short. Therefore the input impedance of $T2$ parralel with $T3$ is zero. In orther words, the load of $T1$ is short. Therefore Z_{in} for $T1$ is zero.