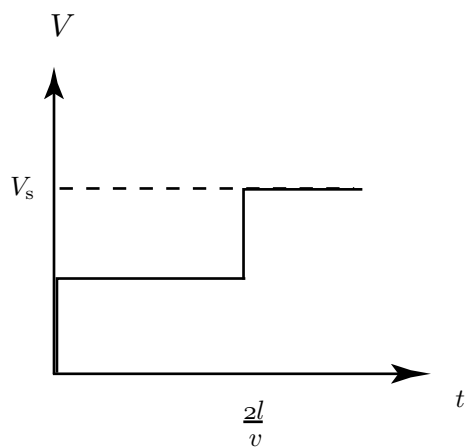


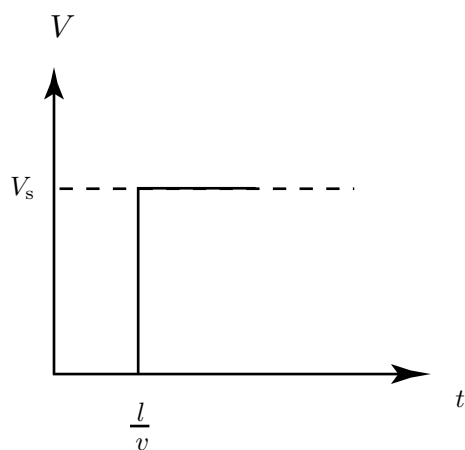
## 6.630 Solution to Problem Set 5

### Solution P5.1

- (a)  $t = 2l/v = 4 \text{ ns}$   
 (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  $V_s$ .



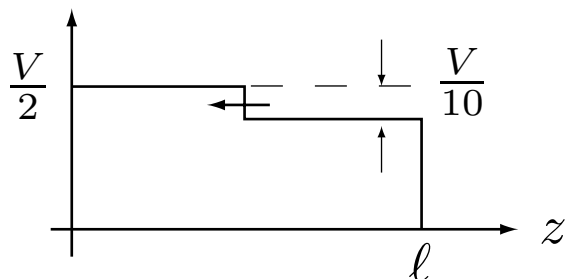
### Solution P5.2

- (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  $\omega t = \pi/2$ ,  $V(z, t) = \text{Re}\{V(z)e^{j\omega t}\} = I_o Z_o \sin kz$ .  
 (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  $T2$  parallel with  $T3$  is zero. In other words, the load of  $T1$  is short. Therefore  $Z_{in}$  for  $T1$  is zero.