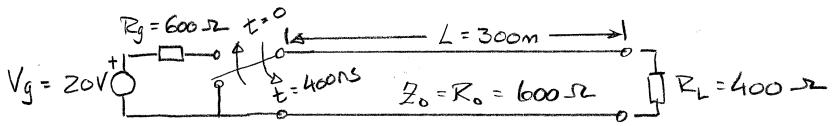
RAF 402G Exam 4-MAY-2016 Problem 5.

a)

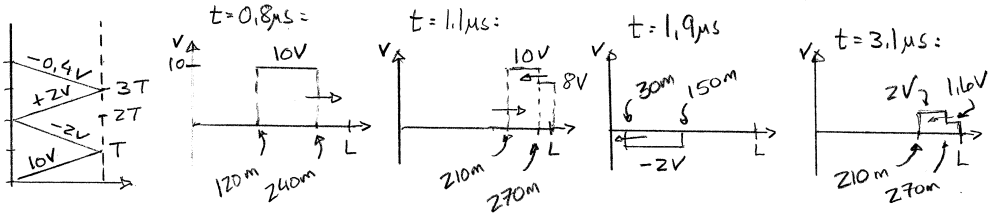


$$T = \frac{L}{c} = \frac{300}{3\cdot 10^8} = 10^{-6}s = 1\mu s = 1000ns.$$

$$V_1 = V_g \cdot \frac{R_0}{R_0 + R_g} = 20 \cdot \frac{600}{1200} = 10V$$

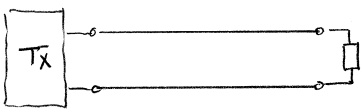
After 460ns, when the pulse returns, the generator side is short circuited, so $R_g = 0$.

$$\Gamma_L = \frac{R_L - R_0}{R_L + R_0} = \frac{400-600}{400+600} = -0,2. \qquad \Gamma_g = \frac{R_g - R_0}{R_g + R_0} = \frac{0-600}{0+600} = -1$$



After 1 minute the line has been short circuited and the voltage is zero (0V) everywhere along the line.

b)



$Z_L = 240 + j480\,\Omega$ $\qquad \lambda = \frac{c}{f} = \frac{3\cdot 10^8}{1\cdot 10^6} = 300m$

$$z_L = \frac{Z_L}{R_0} = \frac{240 + j480}{600} = 0,4 + j0,8$$

y_L is the opposite point on the Smith chart: $y_L = 0,5 - j1$

$$\Rightarrow Y_L = \frac{y_L}{R_0} = \frac{0,5 - j1}{600}$$

$$= 0,833 - j1,667\ mS$$

Standing wave ratio from the Smith chart: $S = r_M \approx 4,4$

$$\frac{|V_{max}|}{|V_{min}|} = S \Rightarrow |V_{max}| = 10 \cdot 4,4 = 44V$$