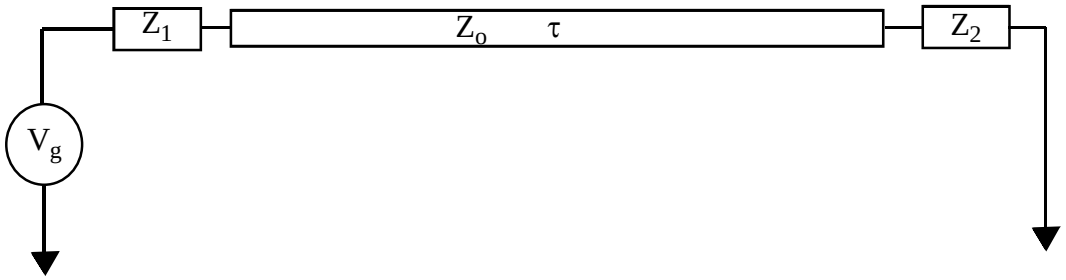
ECE 546 HOMEWORK No 3 Due Wednesday, February 17, 2016

1. Write a program that simulates the response (voltage at near and far ends) of a losseless transmission line terminated with linear resistive loads. Test your program using the example shown below . Use Z_o = 75 Ω, τ = 2.37 ns, Z_1 = 50 Ω, , Z_2 =1 KΩ. Optimize your code to minimize run time. Show plots of the pulse response at the near and far ends of the line. Give a listing of your program.



The pulse characteristics for $V_g(t)$ are as shown in the figure below, with

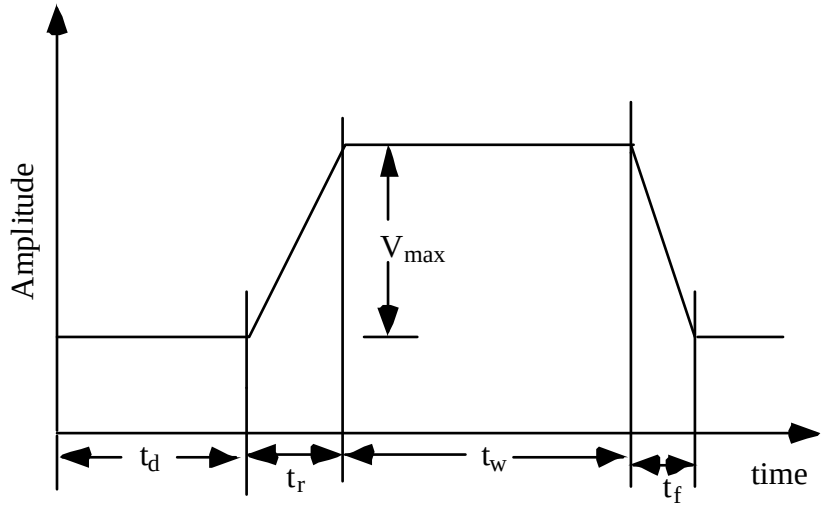
time delay: t_d = 1 ns

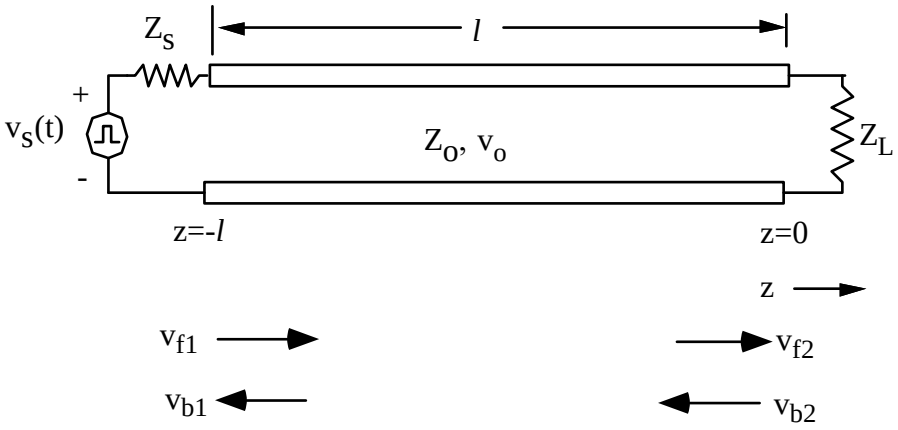
rise time: t_r = 1 ns

fall time: t_f = 1 ns

pulse width: t_w = 20 ns

pulse amplitude: V_{max} = 4 volts





Use the following equations:

$v_{f1}(t) = \Gamma_1 v_{b2}(t - \tau) + T_1\, v_s(t)$ $\quad$ $v_{b2}(t) = \Gamma_2 v_{f1}(t - \tau)$

$v_{f2}(t) = v_{f1}(t - \tau)$ $\quad$ $v_{b1}(t) = v_{b2}(t - \tau)$

$v_1(t) = v_{f1}(t) + v_{b1}(t)$ $\quad$ $v_2(t) = v_{f2}(t) + v_{b2}(t)$

$\tau = l/v$ $\quad$ time delay

$$\Gamma_1 = \frac{Z_s - Z_o}{Z_s + Z_o} \qquad \Gamma_2 = \frac{Z_L - Z_o}{Z_L + Z_o} \qquad T_1 = \frac{Z_o}{Z_s + Z_o}$$