ECE 424
MICROWAVE CIRCUITS

Homework #4

Problems 5.1, 5.5, 5.7 in your textbook.

Consider a 5V source with a large internal resistance of $R_g = 1000$ Ohms. The source is attached to an air-filled 30cm long transmission line of characteristic impedance Zo=50 Ohms. The line is terminated to an open. We are interested in the transient response of the line to a step function, generated when a switch is closed at t=0 connected in series to the 5V source.

This situation is a model for CMOS logic where the implicated load impedances are very high. The source may represent the clock generator and the open a CMOS logic gate.

(a) Calculate the half round-trip period on the line.

(b) Calculate the voltage at the input of the line at t=0.

(c) Generate and plot the bounce diagram from 0 to 7ns.

(d) Derive a general expression for the voltage at the load as a function of time.

(e) Determine the steady-state voltage at the load as $t \to \infty$.

(f) Sketch the voltage waveform at the load as a function of time.

(g) Calculate the time required so that the voltage at the load reaches 90% of its steady-state value found in part (f).