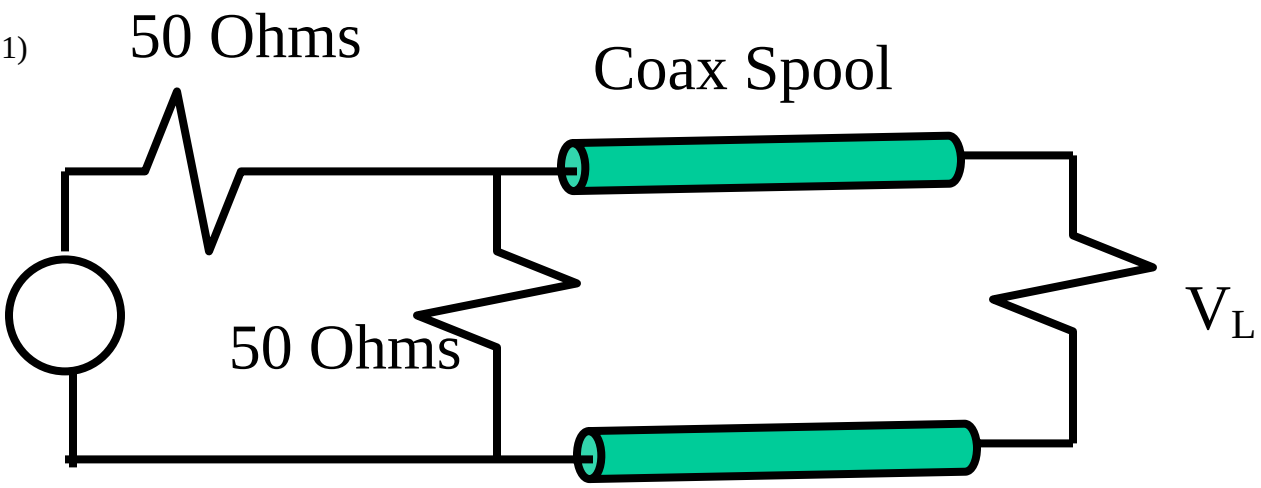
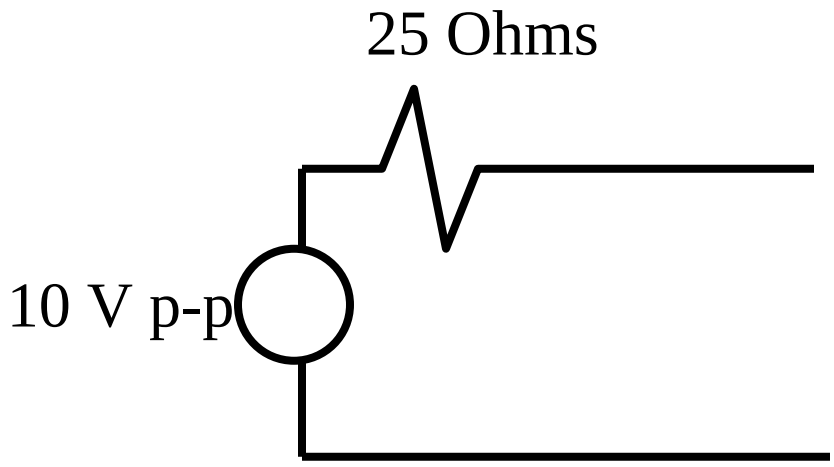
Fields and Waves
Fall 2008
Homework 3

1)



Set up the experiment to measure the input and the output voltage. Use two 50 Ohm terminators, one on the load end and another on the generator end on a T connector. The other 50 Ohms represent the impedance of the function generator. The generator is expecting a load of 50 Ohms and the voltage on the output display is the terminal voltage assuming that the generator sees 50 Ohms. Set the generator to 10 V P-P, square wave 1MHz burst mode (we want to keep the pulse length < 300 ns). The Thevenin equivalent of the input to the transmission line is



The amplitude of the forward wave down the line is found from a voltage divider rule with the line being represented by $Z_{0.}$ Find the amplitude of the forward wave. For an 80 meter long cable, what is the delay time? The spools are not quite 80 meters long so find the length by looking at the transit time of the wave.

Repeat the experiment with the 93 Ohm terminator at the load end. Find the reflection coefficients at the load and at the source. Make a "bounce" diagram up to 6T and plot the voltage at the generator end and the load end.

2. A lossless transmission line of length $\ell = 0.35\lambda$ has a characteristic impedance of $Z_0 = 100\Omega$ and is terminated with a load impedance of $Z_L = (60 + j30)\Omega$. Find Γ, S and Z_{in}.

3. A generator with sinusoidal voltage $V_s = 100\angle 0^0$ and $Z_s = 50\Omega$ is connected to a load of $Z_L = 75\Omega$ through a 50 Ohm lossless line of $\ell = 0.15\lambda$. Find the input impedance of the line at the generator end. Find the current and voltage at the input end of the line. Find the average power delivered to the line and the average power delivered to the load.