EE331 — Homework #3 / Due Wednesday, Feb. 5, 2020 **at the beginning of class**

1. A planar transmission line with $w = 6$ mm, $d = 0.25$ mm, and $t = 25$ mm has conducting plates with $\sigma_c = 5.5 \times 10^7$ S/m and a dielectric with $\sigma = 3.5 \times 10^{-3}$ S/m and $\varepsilon = 25$ pF/m. Calculate R, L, G, and C for $f = 750$ MHz. Assume $\mu = \mu_c = \mu_0 = 4\pi \times 10^{-7}$ H/m.

2. For Prob. #1, calculate (a) the propagation constant γ and (b) the characteristic impedance of the line Z_0. (c) The attenuation is non-zero, so we know the line is lossy. What's the cause of this loss?

3. Now connect the line of Prob. #1 to a load with an impedance of 100 Ω. Calculate (a) the voltage reflection coefficient and (b) the standing wave ratio.

4. Next connect the other end of the line of Prob. #1 to a signal generator with $V_g = 12$ V, $\theta_g = 0$, and $Z_g = 10\ \Omega$. Let the length of the line be $l = 15$ cm. Calculate (a) the input impedance Z_{in} and (b) V_0^+. **Be sure to use the equation I gave in class, not the equation for V_0^+ in the book.**

5. *Putting it all together!* Finally, (a) find $V_s(z)$ anywhere along the line with the load and generator as given and using the various parameters you found in the other problems and (b) convert $V_s(z)$ to its instantaneous form.