**EE 481/581 Microwave Engineering (Fall 2025)**

**Homework 2**

**Tuesday, September 9, 2025**

1) We have made a parallel plate transmission line by cutting a 0.75" wide strip from a 0.25" thick plexiglass board from Ace Hardware covered with lead tape (24 μm thick). If the transmission line is operated at 3 GHz at room temperature, determine: a) the effective conductivity and complex permittivity of the plexiglass, and b) the skin depth & distributed parameters $R$, $L$, $G$, & $C$ of the transmission line. [Hint: Appendices E, F, & G.]
2) For the plexiglass parallel plate transmission line in 1), calculate: a) propagation constant, b) attenuation constant (both Np/m and dB/m), c) phase constant, d) characteristic impedance (both polar & rectangular forms), e) wavelength, and f) phase velocity.
3) Similar to equations (2.40a) & (2.40b), determine equations for $I_{max}$ & $I_{min}$ and the corresponding reflection coefficient conditions for each. Note that $I_{max}$ & $I_{min}$ pair up with $V_{max}$ & $V_{min}$ at corresponding locations, which goes with which?
4) For each current & voltage pair in 3), define an impedance as the ratio of phasor voltage to current and determine equations for $Z_{max}$ and $Z_{min}$.
5) 2.1
6) 2.8
7) Using a lossless transmission line (75 Ω and $v_p = 2.3\times10^8$ m/s), find the shortest a) open and b) short circuit stubs that appear as a 1 pF capacitor at 1.6 GHz.
8) 2.19
9) EE 581 only- For the transmission line of problem 2.8, analytically determine the locations (in terms of $\lambda$) of all possible current and voltage maxima and/or minima.

**Due Monday, September 15, 2025.**

- Solve all problems analytically.
- Express all currents, voltages, & reflection coefficients in the polar/phasor format with angles in degrees (e.g., $10\angle 30°$ V). Express complex permittivity & impedances in rectangular format (e.g., $10 + j30\,\Omega$).