Homework 3
EE 381 Electric & Magnetic Fields (Fall 2025)
Wednesday, September 17, 2025

1) A radio engineer needs a capacitive reactance of $-j45\ \Omega$ at a frequency of 980 MHz for a matching network. The engineer is required to use stubs made from $50\ \Omega$ coaxial transmission line with a phase velocity of $u = 2.3 \times 10^8$ m/s. Find the length of the shortest realizable stubs with (a) open-circuit and (b) short-circuit terminations and sketch equivalent circuits for the resulting stubs.
2) 11.41 Use Smith chart. Also, find $Z_{\min}$.
3) 11.44 Use Smith chart. Also, find Γ_L, y_{in}, and SWR.
4) 11.50 Use Smith chart.
5) 11.52 Use Smith chart. Also, find the load reflection coefficient, SWR, and shortest distance from the load to where the voltage has the largest magnitude. Distances are in terms of λ.

Due Monday, September 22, 2025.

Notes:

- Express all phasor quantities, i.e., currents & voltages, and reflection coefficients in polar/phasor format with angles in degrees (e.g., $10\angle 30°\,\text{V}$, $12\angle 140°\,\text{mA}$). Express admittances, impedances & propagation constants in rectangular format (e.g., $Z_L = 10 + j30\,\Omega$).
- Where relevant, use **one** Smith chart per problem inserted immediately after the corresponding problem. **Clearly label** all work and relevant quantities on each Smith chart (e.g., Z_0, u & f or λ, all points, arcs, distances, …).