

Homework 3
EE 381 Electric & Magnetic Fields (Fall 2026)
Wednesday, September 16, 2026

- 1) A lossy transmission line ($Z_0 = 75 \, \Omega$, $u = 2.4 \times 10^8 \, \text{m/s}$, $\alpha = 38 \, \text{dB/100 m}$) of length $\ell = 110 \, \text{cm}$ is terminated with an unknown load Z_L . An input reflection coefficient $\Gamma_{\text{in}} = 0.6 \angle 30^\circ$ is measured. The transmission line is connected to a generator operating at 400 MHz with voltage $V_g = 32 \angle 0^\circ \, \text{V}$ and $50 \, \Omega$ impedance. First, sketch the transmission line circuit. Then, determine a) the propagation constant $1/\text{m}$ & wavelength λ , b) input impedance as well as phasor current & voltage, c) load reflection coefficient & impedance and SWR, d) phasor forward voltage wave amplitude, e) phasor load current & voltage, and f) time-average power input and delivered to load.
- 2) 11.48 Use Smith chart. Also, find SWR.
- 3) A lossless transmission line ($Z_0 = 50 \, \Omega$, $u = 2.4 \times 10^8 \, \text{m/s}$), operating at 800 MHz, has an input reflection coefficient of $0.6 \angle 113.6^\circ$. If the transmission line is 68.72 cm long, use a Smith chart to find: a) input impedance, b) SWR, b) load reflection coefficient Γ_L , c) load impedance Z_L , and d) load admittance Y_L .
- 4) A lossless transmission line ($Z_0 = 50 \, \Omega$, $u = 2.5 \times 10^8 \, \text{m/s}$) operates at 2 GHz and is terminated with an unknown load. The SWR is measured to be 3. The nearest voltage maxima is measured to be 5.11 cm from the load. Find R_{max} , Γ_L and Z_L using a Smith chart.

Due Monday, September 21, 2026.

Notes:

- Express all phasor quantities, i.e., currents & voltages, and reflection coefficients in polar/phasor format with angles in degrees (e.g., $10 \angle 30^\circ \, \text{V}$, $12 \angle 140^\circ \, \text{mA}$). 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, ...).