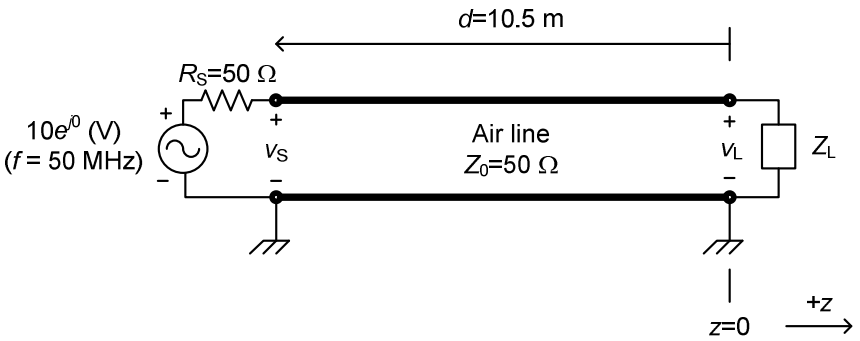
University of Portland
School of Engineering

EE 301
Spring 2013
A.Inan

Homework # 5–Sinusoidal Steady-State (SSS) Waves on Transmission Lines
(Assigned: Friday, March 8, 2013)
(Due: Friday, March 22, 2013, 11:25a.m.)

(1) A 50 Ω, 10.5 m long air transmission line terminated with a load impedance of Z_L=70+j10 Ω is excited by a sinusoidal voltage source, as shown.



Calculate the following:

(a) The load reflection coefficient Γ_L.
(b) The standing wave ratio S on the line.
(c) Find all the V_{max} and V_{min} positions (in actual lengths) on the line and present your results in a table form.
(d) Find the input impedance Z_{in} seen at each V_{max} and V_{min} position.
(e) Find the input impedance Z_{in} seen at the source end of the line and draw the equivalent lumped circuit with respect to the source end.
(f) Find the phasor voltages V_S, V^+, V^-, and V_L.
(g) Find the V_{max} and V_{min} values.
(h) Find the time-average powers P^+, P^-, P_{RS}, P_L, and P_{source}. What percentage of the power carried by the incident wave reflects back to the source?
(i) (Optional) Find the positions on the line where $Z_{in}=Z_0+jX_{in}$. Find X_{in} values at these positions.
(j) (Optional) Find the I_{max} and I_{min} positions on the line.
(k) (Optional) Find the I_{max} and I_{min} values.
(l) Repeat all the above calculations for a load impedance of Z_L=15–j35 Ω.

An Important Reminder Note:
EE 301-Midterm # 2 is scheduled to be given on Friday, April 5, 2013! ☹
(It will be in-class closed-book exam. Two formula sheets will be allowed.)