University ☺f P☺rtland
Sch☺☺l ☺f Engineering

EE 301-Electromagnetic Fields-3 cr. hrs.
Spring 2011

Midterm Exam # 2
Sinusoidal Steady-State Waves on Transmission Lines

(Prepared by Professor A. S. Inan)

(Monday, April 18, 2011)
(Closed Book Exam; Formula Sheets Allowed)
(Total Time: 55 mins.)

Did you know that yesterday in the 21st century was the 221st anniversary of Benjamin Franklin's death? ☺ (He died on April 17, 1790, at age 84.)

Name:_____ ☺

Signature:_____ ☺

"Honesty is the best policy."
Aesop (~ 620B.C. –?)

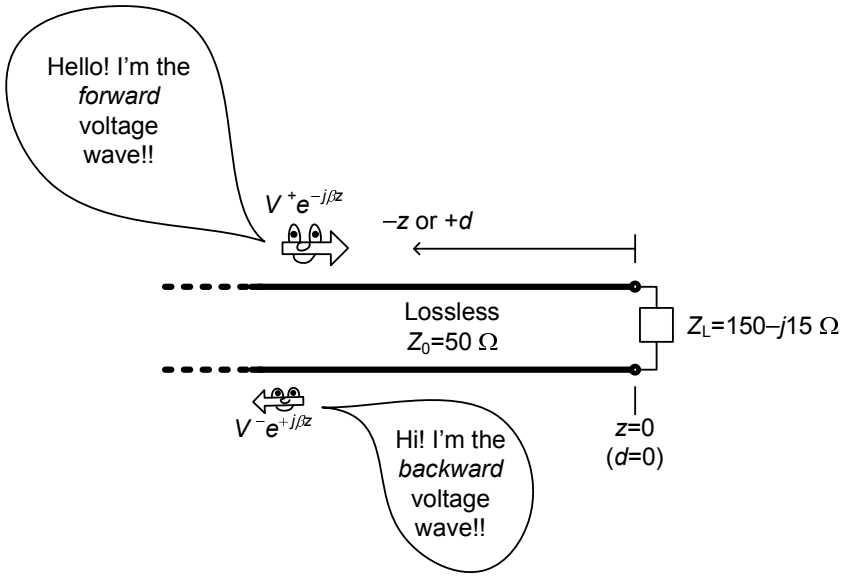
"An honest mind possesses a kingdom."
Lucius Annaeus Seneca (4B.C.–65A.D.)

"Honest people are the true winners of the universe."
Anonymous

This table will be used by Inan for grading!

Problem #	Points gained
#1	
#2	
#3	
Total	

(1) (*15 mins.*, *Total: 40 points*) **A lossless transmission line terminated with a complex impedance.** A $50\,\Omega$ transmission line is terminated with an capacitive load impedance given by $Z_L = 150 - j15\,\Omega$, as shown.



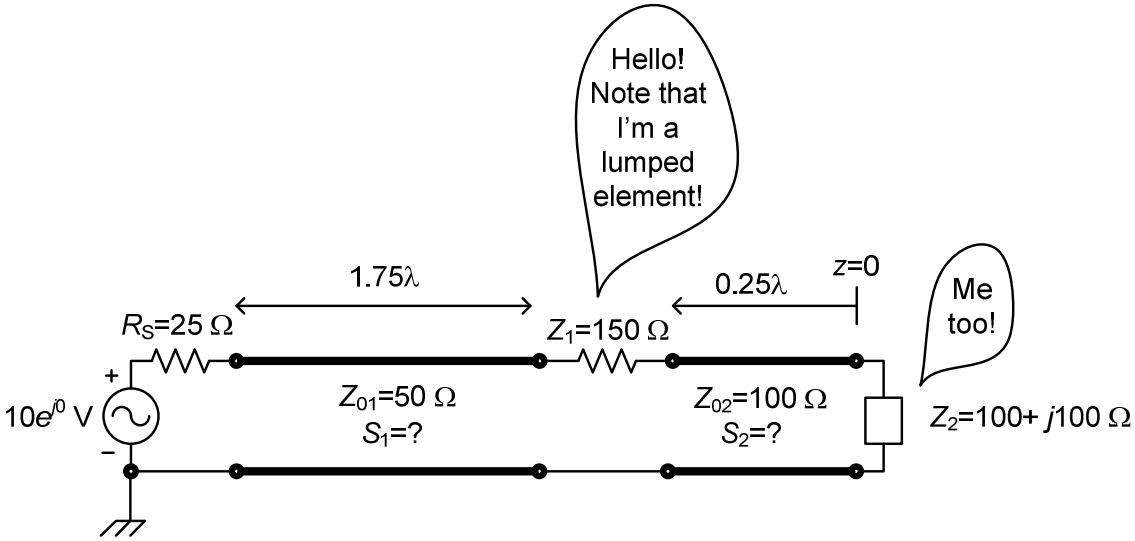
(a) (*10 points*) Calculate the load reflection coefficient, Γ_L. (Provide your answer in polar form.) Show your work!

(b) (*10 points*) What is the value of the standing wave ratio, *S*, on the line?

(c) (*10 points*) Find the percentage time-average incident power that is absorbed by the load.

(d) (*10 points*) Find the V_{max} and V_{min} positions nearest to the load. Provide your answers as electrical lengths.

(2) (*15 mins.*, *Total: 30 points*) **Two cascaded transmission lines.** Consider the transmission line circuit as shown.



(a) (*15 points*) Find the standing wave ratio on each line. Show your work!

(b) (*15 points*) Find the time-average power delivered to the load impedance Z_2.

(3) (*15 mins., 30 points*) **Input impedance.** Consider the transmission line circuit as shown where Z_P impedance represents a parallel lumped element. Find the input impedance Z_{in}. Show your work step by step.