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

# EE 301-Electromagnetic Fields-3 cr. hrs.
# Spring 2005

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

(Prepared by Professor A. S. Inan)

(Monday, April 11, 2005)
(Closed Book Exam; 1 Formula Sheet Allowed)
(Total Time: 55 mins.)

**Name:**_____ ☺

***Signature:***_____ ☺

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

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

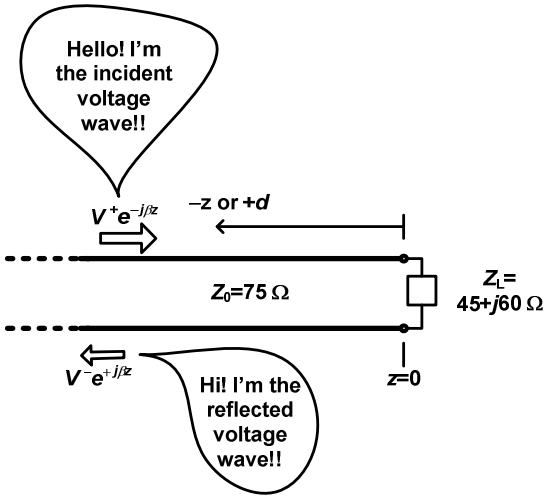
***"Honest people are the true winners of the universe."***
**Anonymous**

***"Honesty is not for sale."***
**A. Inan**

***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 $75\,\Omega$ transmission line is terminated with an inductive load impedance given by $Z_L = 45 + j60\,\Omega$, as shown.



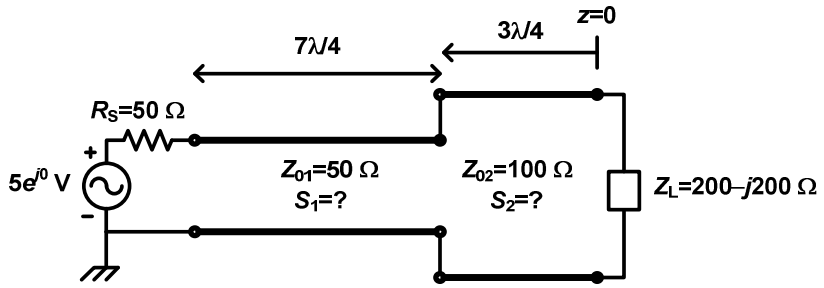

(a) (*10 points*) Calculate the load reflection coefficient, $\Gamma_L$. (Provide your answer in polar form.) Show your work!

(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.

(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.