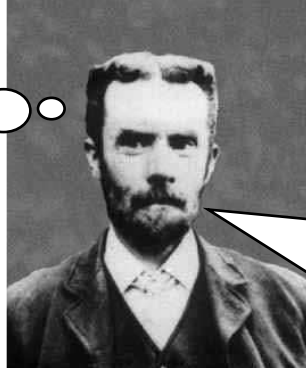*University of Portland*
School of Engineering

EE 301-Electromagnetic Fields-3 cr. hrs.
Spring 2014

You will pay a heavy price for giving these students such tough tests and scaring them to death Inaaan! @*$*#&XΘχ@*§ξ!

Best of luck to you EE 301 students and please, demonstrate to Inan that unlike what everyone might think, his tests are nothing but simply a piece of cake! (Bring his fame down about giving challenging exams!)

Midterm Exam # 1
(Prepared by Professor A. S. Inan)

(Friday, February 21, 2014)
(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**

(1) (20 mins., <u>Total:</u> 50 points) **Step excitation of a lossless line.** A uniform, lossless transmission line is excited with a step source as shown.

(a) (30 points) Draw a bounce diagram showing all the voltage waves including their values on each line, for a time period of $0 \leq t \leq 6$ ns.
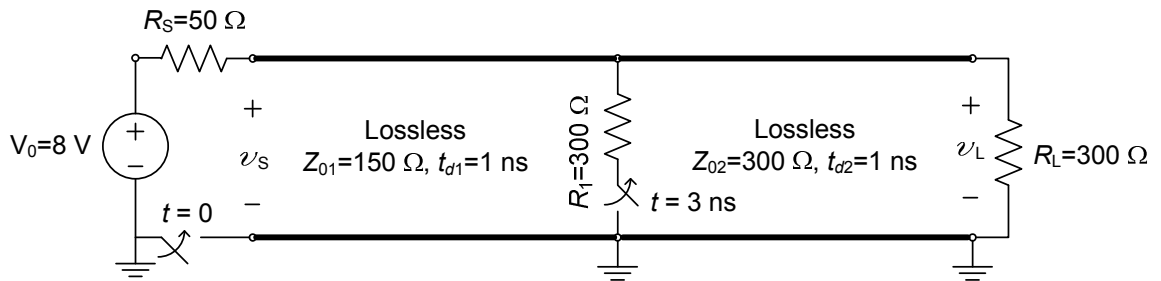
(b) (20 points) Using the data in your bounce diagram, calculate the values of the source-end voltage $\mathcal{V}_S$ and the load-end voltage $\mathcal{V}_L$ at the specific times indicated in the table below and enter these values in the table. Show your work.

t (ns)	$\mathcal{V}_S(t)$ (v)	$\mathcal{V}_L(t)$ (v)
1^+		
2^+		
3^+		
4^+		
5^+		
6^+		

(2) (20 mins., 50 points) **Reactive element at the junction.** In the transmission-line circuit shown, find the complete mathematical expressions and sketch both the source-end voltage v_S and the load-end voltage v_L as a function of time. Sketch the two waveforms separately. Provide all the pertinent values on each sketch.

$R_S=50\ \Omega$ $R_1=100\ \Omega$

6 V $t=0$

v_S Lossless $Z_{01}=50\ \Omega,\ t_{d1}=5$ ns $C_1=20$ pF   Lossless $Z_{02}=150\ \Omega,\ t_{d2}=7.5$ ns v_L $R_L=150\ \Omega$