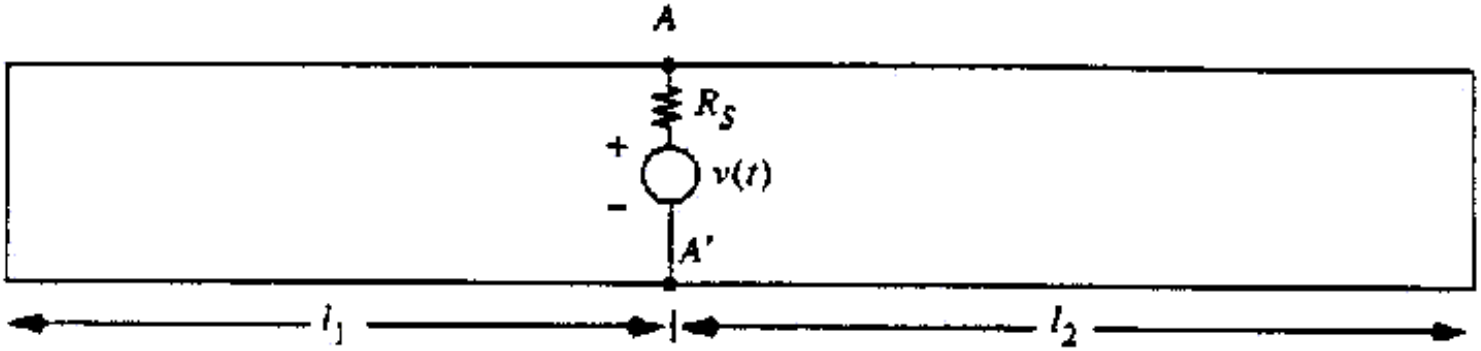
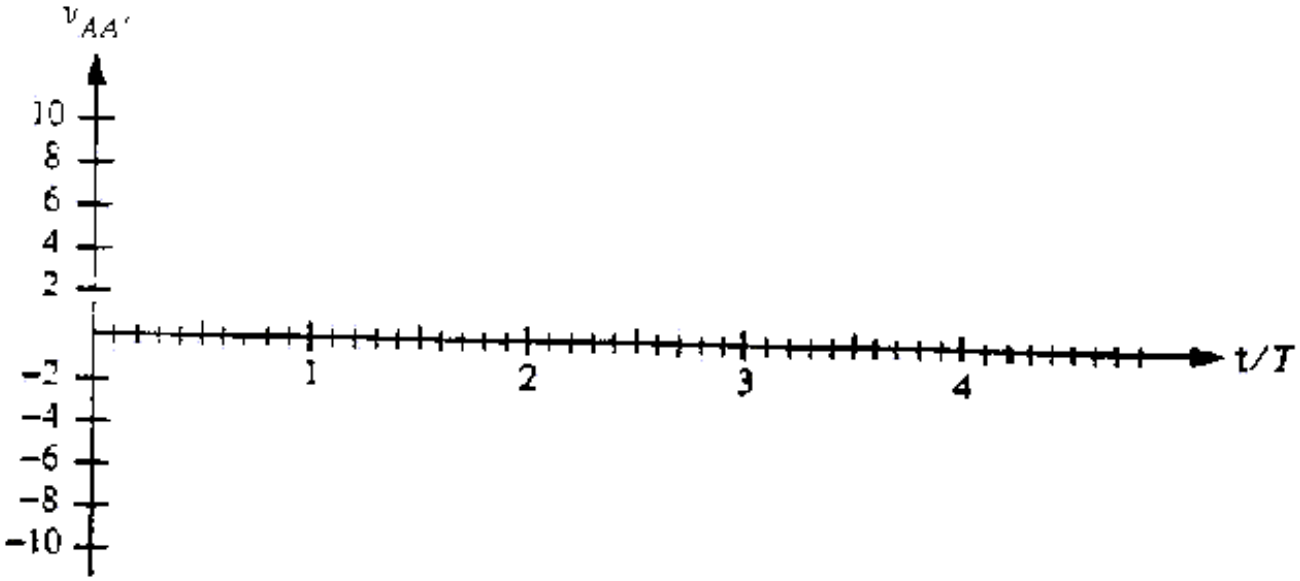
EECS 117A, Fall 1998
Midterm #1
Professor S.E. Schwarz

Instructions: You may use the textbook, a pocket calculator, and drafting instruments. Write answers in the space provided. Show your work on the Smith chart.

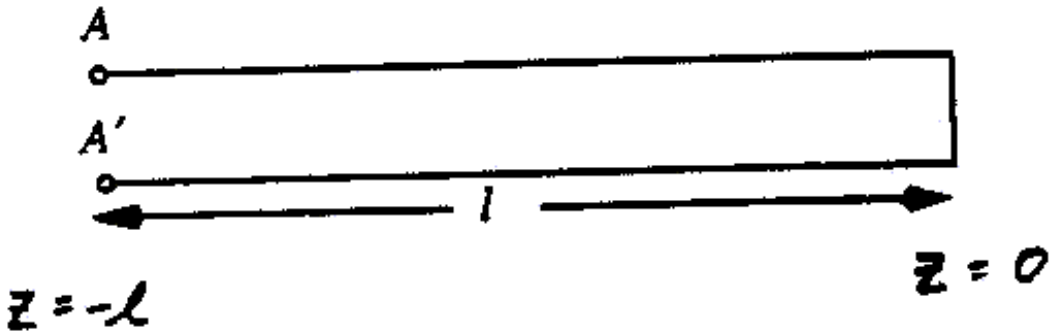
Problem #1 (30 points)

The circuit below contains a Thevenin voltage source and two transmission lines of length l1 and l2. Let T = l1/U (where U is the phase velocity), l2 = 1.25l1, Rs = Z0/2. The voltage source v(t) = 10 volts for 0 <= t <= 0.2T, and zero for other times. Graph the voltage between terminals A and A' on the scales below, over the range 0 < t < 4.8T. Show amplitudes of pulses clearly on the graph. (Note: The lines are not the same length, l2 = 1.25l1.)





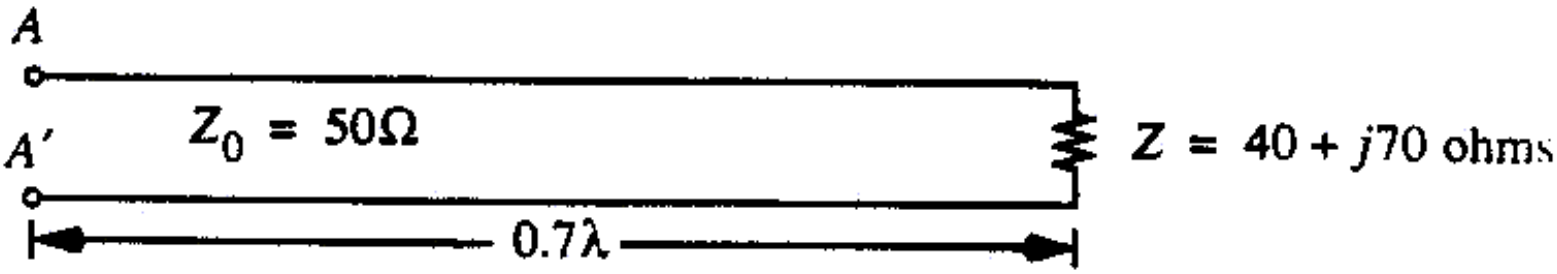
Problem #2 (35 points)



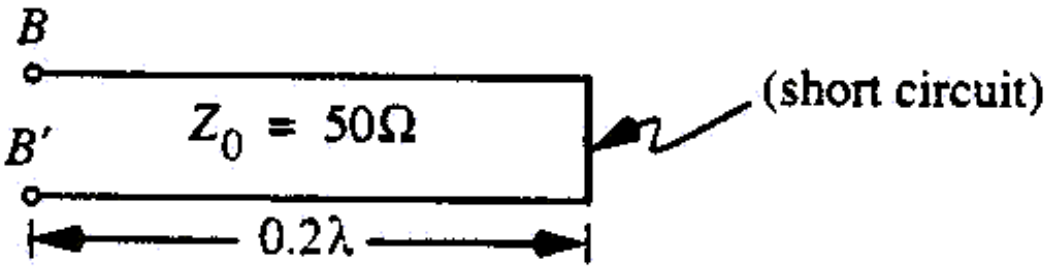
In this problem the transmission line has a certain amount of loss, so that k = beta - j*alpha.
(a) (10 pts.) Assume the voltage phasor representing the wave moving to the right at position AA' is v_+(A) = V1. What is the phasor representing the reflected wave (moving toward the left) at position AA'?
Answer: v_-(a) = _____
(b) (15 pts.) For the rest of this problem, let Beta*l = pi/2. Find the impedance seen looking into the line at position AA'.
(c) (10 pts.) Find the limit of your answer to (b) when alpha becomes equal to zero, and explain why your answer is reasonable in this limit.

Problem #3 (35 points)

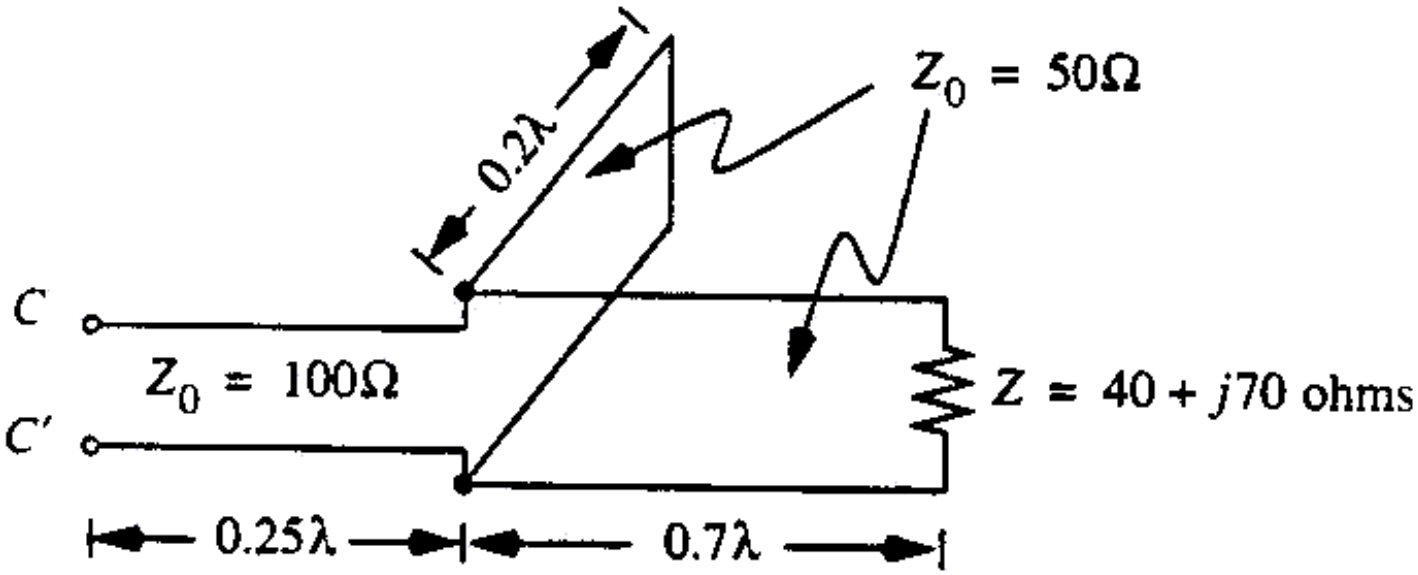
Show your work on the Smith chart.
(a) (10 pts.) Find the impedance seen looking to the right into terminals AA'.



Answer: Za = _____ohms
(b) (10 pts.) Find the impedance seen looking into terminals BB'.



Answer: Zb = _____ohms
(c) (15 pts.) Find the impedance looking into terminals CC'. (Note that one of three transmission lines has Z0 = 100 ohms).



Answer: Zc = _____ohms

Smith Chart: