Quiz 5

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E&M II
Prof. Woo-Young Choi

Name:

Prob. 1(3)

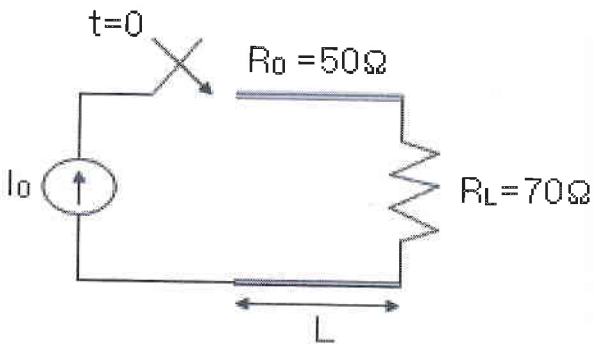
A transmission line circuit is connected to an ideal current source, which produces a constant step current of I_0 at t=0 as shown below. The length of the line is L and the velocity of wave propagation on the line is v.

(a) Sketch the voltage on the line, V(z), for t = 0.5 L/v.

(b) Sketch the current on the line, V(z), for t = 1.5 L/v.

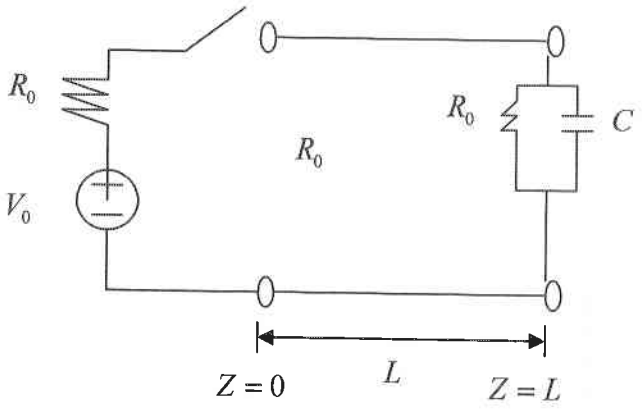
(c) Sketch the voltage on the line, V(z), for t = ∞.

Make sure you express the magnitude of waves in terms of I_0.



Prob. 2(4)

A load made up of a resistor and a capacitor in parallel is connected to a transmission line as shown below. A step voltage is applied to the transmission line at t = 0. The capacitor is free of charge initially and the voltage wave propagates the transmission line with velocity v.

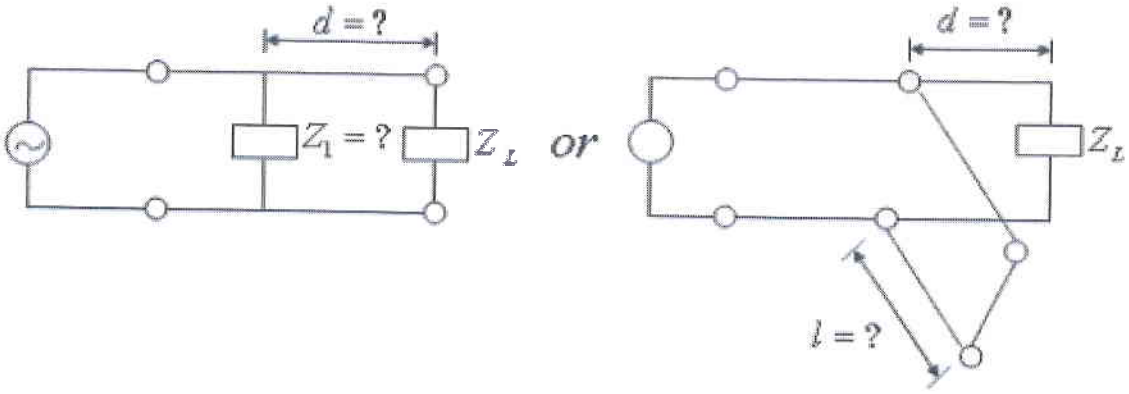


(a)(2) Plot $v_L(t)$, the voltage across the load. Make sure you specify important parameters in your plot.

(b)(2) Plot v(t) at z= L/2. Make sure you specify important parameters in your plot.

Prob. 3(3)

We want to achieve impedance matching for a load having $Z_L = 20 - j\,20(\Omega)$ by placing a short-stub on the transmission line. Use the Smith Chart answering following questions. Assume the transmission line has characteristic impedance of 50 Ω.



(a) Determine the shortest possible distance for d in terms of wavelength λ.

(b) Determine the impedance for Z_1.

(c) Determine the shortest possible short stub length in terms of wavelength λ.