ECE 391 Transmission Lines, Winter 2020

Test Date: 03/04/2020

Problems: 4

Total Pages: 7

Name: _____

1. (10 points) _____

2. (10 points) _____

3. (15 points) _____

4. (15 points) _____

Total (50 points) _____

Good Luck

Problem 1: (10 points) The following data are specified at f=1MHz for a given transmission line. Z_0=(99.85 - j3.008)Ω; α=4.345dB/m; β= 16.328×10^{-3}rad/m. Determine the per-unit-length R, L, G, C transmission line parameters.

R = _____

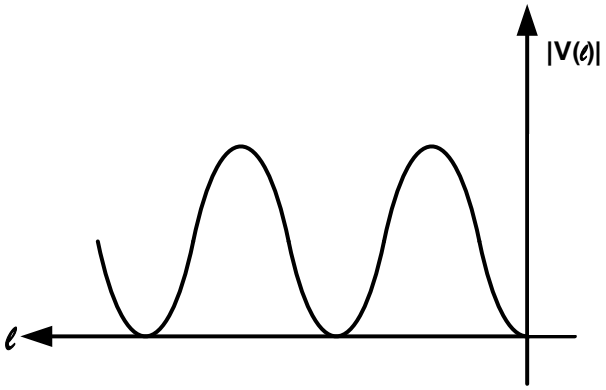
L = _____

G = _____

C = _____

Problem 2: (10 points) Circle the termination load on the transmission line from the voltage standing wave and give reason for your answer.

(a)



$Z_L=R;\ R>Z_0$ $Z_L=j\omega L$

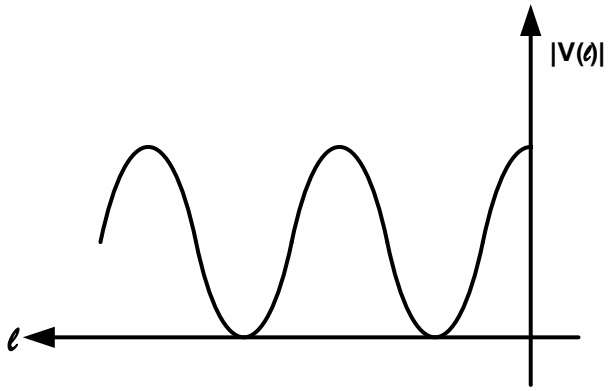
$Z_L=R;\ R<Z_0$ $Z_L=1/j\omega C$

$Z_L=0$ $Z_L=R+1/j\omega C$

$Z_L=\infty$ $Z_L=R+j\omega L$

Reason:

(b)



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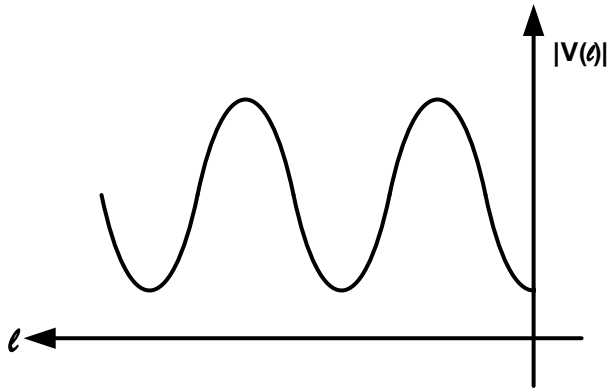
$Z_L=R;\ R<Z_0$ $Z_L=1/j\omega C$

$Z_L=0$ $Z_L=R+1/j\omega C$

$Z_L=\infty$ $Z_L=R+j\omega L$

Reason:

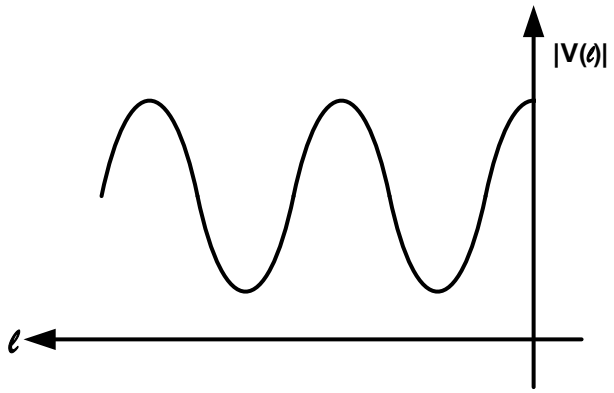
(c)



$Z_L=R;\ R>Z_0$	$Z_L=j\omega L$
$Z_L=R;\ R<Z_0$	$Z_L=1/j\omega C$
$Z_L=0$	$Z_L=R+1/j\omega C$
$Z_L=\infty$	$Z_L=R+j\omega L$

Reason:

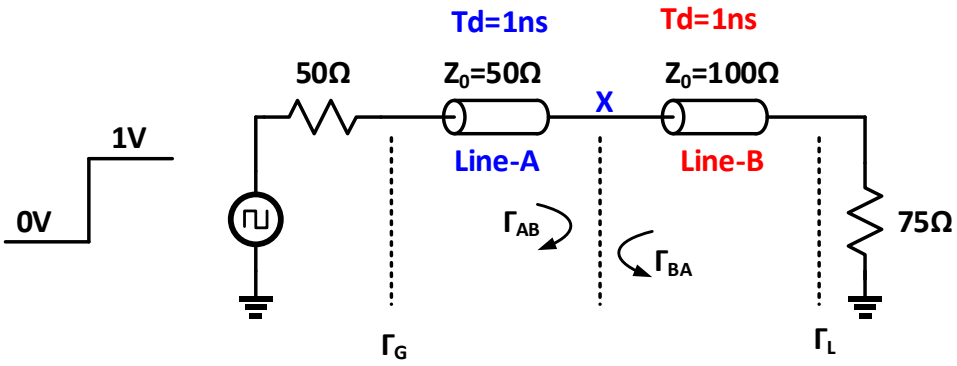
(d)



$Z_L=R;\ R>Z_0$	$Z_L=j\omega L$
$Z_L=R;\ R<Z_0$	$Z_L=1/j\omega C$
$Z_L=0$	$Z_L=R+1/j\omega C$
$Z_L=\infty$	$Z_L=R+j\omega L$

Reason:

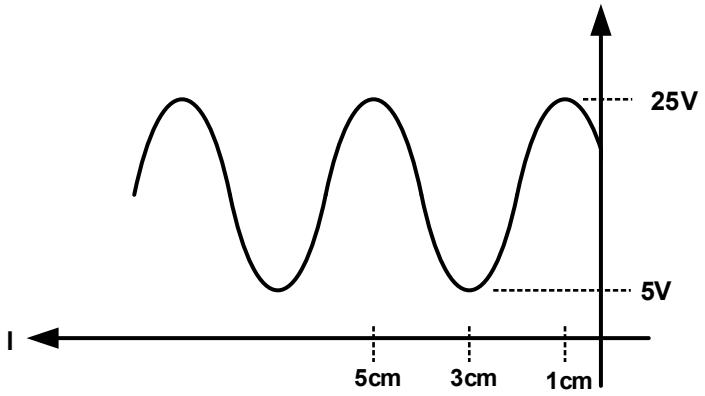
Problem 3: (15 points) Given the following transmission line:



(a) **(10 points)** Draw lattice diagram for up to 6ns.

(b) **(5 points)** Draw waveform of voltage on node X versus time for up to 6ns.

Problem 4: (15 points) A transmission line with characteristic impedance of Z_0=50Ω is terminated with an un-known load impedance Z_L. The voltage standing wave pattern along the transmission line as a function of distance is shown below.



(a) **(10 points)** Calculate VSWR, wavelength on the line, magnitude of outgoing wave $|V^+|$, magnitude of maximum and minimum current.

VSWR = _____

λ = _____

$|V^+|$ = _____

|Imax| = _____

|Imin| = _____

(b) **(5 points)** Calculate the phase of the reflection coefficient at the load-end and circle the load Z_L at the end of the transmission line.

Phase = _____

$Z_L=R;\ R>Z_0$	$Z_L=j\omega L$
$Z_L=R;\ R<Z_0$	$Z_L=1/j\omega C$
$Z_L=0$	$Z_L=R+1/j\omega C$
$Z_L=\infty$	$Z_L=R+j\omega L$