Electromagnetic Fields – Assignment 05

#	Student ID	Student Name	Grade (10)
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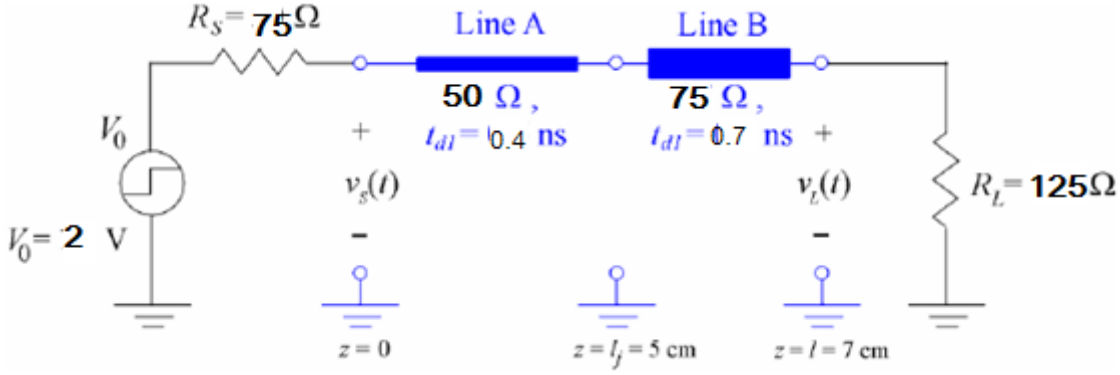
Delivery Date	

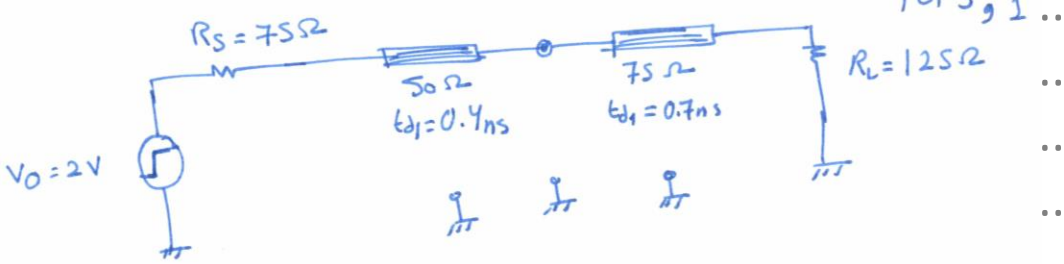
١. يتم تسليم التمرين محلولا في خلال أسبوع من تاريخ التمرين، و يتم حذف درجتين من التمرين عن كل أسبوع تأخير
٢. يتم التسليم لمعيد المقرر مباشرة
٣. تتم أجابه التمرين في نفس ورق الأسئلة

Q1

Consider a system shown in Fig. Find the terminal voltages $v_S(t)$, $v_L(t)$.



Sol 1



$$\Gamma_S = \frac{R_S - Z_a}{R_S + Z_a} = \frac{75 - 50}{75 + 50} = 0.2$$

$$\Gamma_{AB} = \frac{Z_b - Z_a}{Z_a + Z_b} = \frac{75 - 50}{75\ 50} = 0.2$$

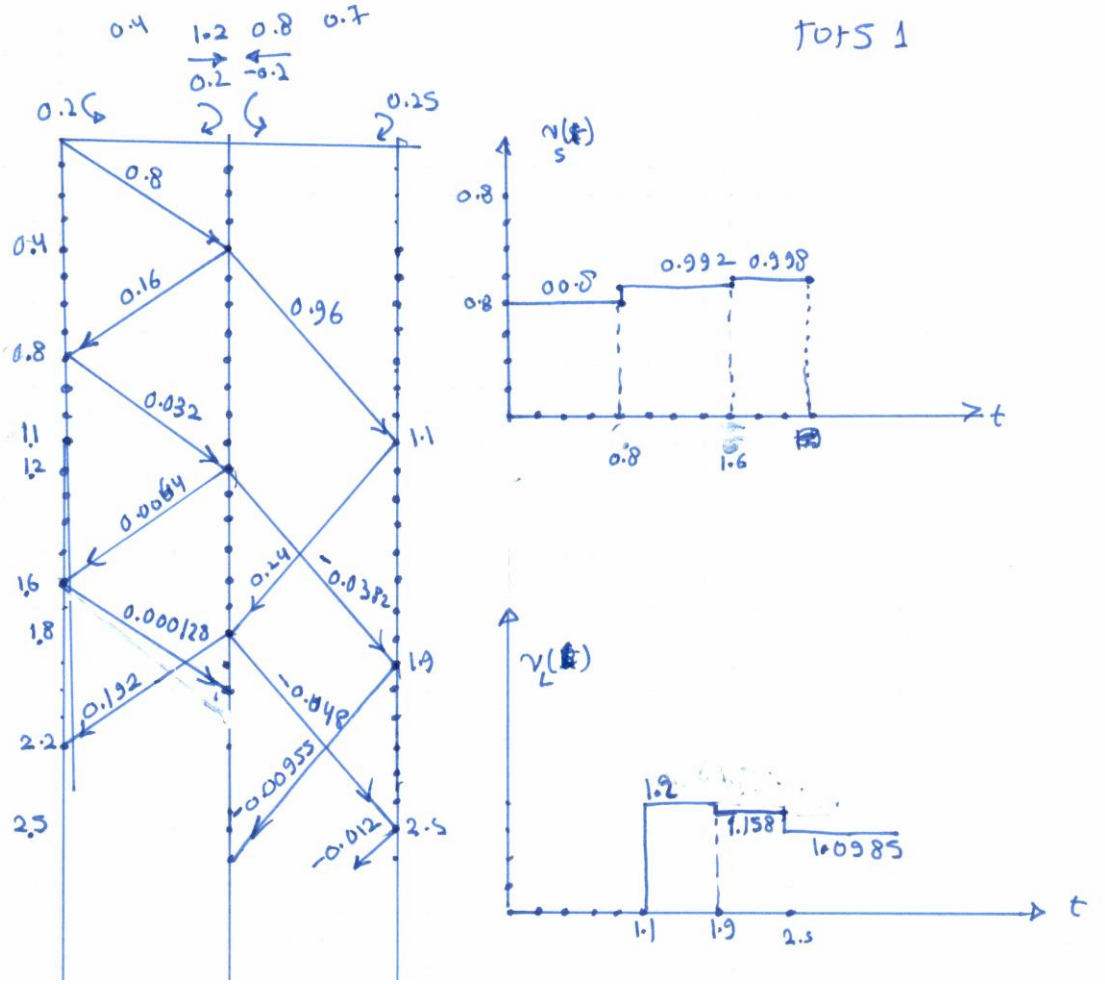
$$T_{AB} = 1 - \Gamma_{AB} = 1.2$$

$$\Gamma_{BA} = \frac{Z_a - Z_b}{Z_a + Z_b} = \frac{50 - 75}{50 + 75} = -0.2$$

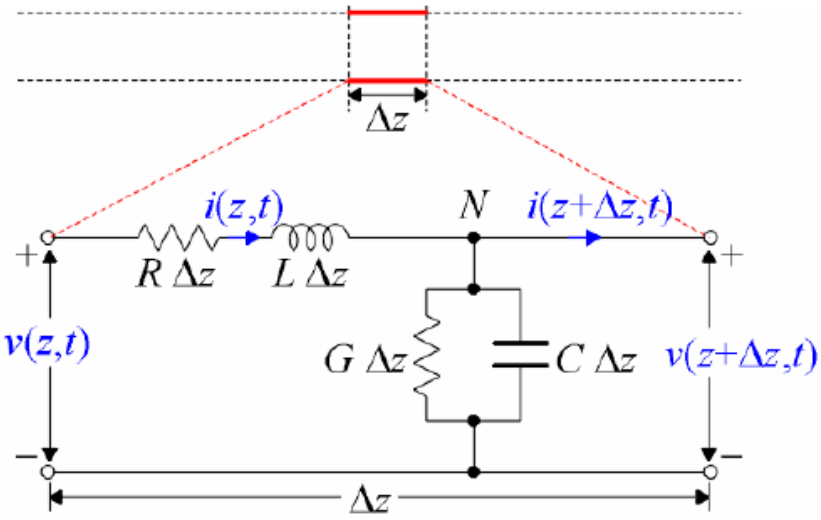
$$T_{BA} = 0.8$$

$$\Gamma_L = \frac{R_L - Z_b}{R_L + Z_b} = \frac{125 - 75}{125 + 75} = 0.25$$

$$V_{1A}^{+} = V_G \frac{Z_A}{Z_A + R_S} = 2 * \frac{50}{50 + 75} = 0.8V$$


TOPS 1
0.4
1.2
0.8
0.7
0.2
-0.2
0.25
0.8
0.16
0.96
0.032
0.00064
0.000128
0.192
0.24
-0.0384
-0.0768
0.00955
-0.012
1.1
1.9
2.5
$v_s(t)$
0.8
0.992
0.998
1.6
$v_L(t)$
1.2
1.158
1.0985
t

Q2	For a lossless transmission line we drives the following equation



Equivalent circuit of a real transmission line.

$$\frac{d}{dz}V(z) = -j\omega L \cdot I(z)$$

$$\frac{d}{dz}I(z) = -j\omega C \cdot V(z)$$

assuming that $R = 0$, $G = 0$
Please modify them if the line is lossy ($R \neq 0$, $G \neq 0$).

Sol 2

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We know that

$$\frac{\partial}{\partial z} v(z,t) = -L \frac{\partial}{\partial t} i(z,t) \Rightarrow \frac{d}{dz} V(z) = -j\omega L\, I(z) \rightarrow (1)$$

for a lossy TX

$$v(z,t) - v(z+\Delta z, t) = i(z,t) R \Delta z + L \Delta z \frac{\partial}{\partial t} i(z,t)$$

When $\Delta z \rightarrow 0$

$$\frac{\partial}{\partial z} v(z,t) = -i(z,t) R - L \frac{\partial}{\partial t} i(z,t) \rightarrow (2)$$

sub from 1

$$\frac{d}{dz} V(z) = -R\, I(z) - j\omega L\, I(z)$$

We know that

$$\frac{\partial}{\partial z} i(z,t) = -C \frac{\partial}{\partial t} v(z,t) \Rightarrow \frac{d}{dz} I(z) = -j\omega C\, V(z) \rightarrow (3)$$

for lossy TX

$$i(z,t) = i(z+\Delta z, t) + C \Delta z \frac{\partial}{\partial t} v(z+\Delta z, t) + G \Delta z\, v(z+\Delta z, t)$$

When $\Delta z \rightarrow 0$

$$\frac{\partial}{\partial z} i(z,t) = -v(z,t) G - C \frac{\partial}{\partial t} v(z,t) \rightarrow (4)$$

Sub from 3

$$\frac{d}{dz} I(z) = -G\, v(z) - j\omega C\, V(z)$$