HW-2 will be posted today

Example 1:

0.5V ⌐⌐   0.5V ⌐⌐   Short circuit on the load.

50Ω $2\,0V$

R_S I_G^+ $Z_0 = 50\Omega$; $t_d = 1ms$ I_L

V_S $0.5V$ ⌐ $-0.5V$ ⌐ V_L 0Ω

1V ⌐   0V ⌐

$\{ -1 \leq \Gamma \leq 1 \}$

$\Gamma_S = 0$ $\Gamma_L = -1$ $\left(\dfrac{R_L - Z_0}{R_L + Z_0} \right)$

$\left\{ \begin{array}{l} \dfrac{V^+}{I^+} = Z_0 \\[3mm] \dfrac{V^-}{I^-} = -Z_0 \end{array} \right\}$

V_S V_L

x

$I_1^+ = 10mA$ $V_1^+ = 0.5V$

1ms

$V_1^- = -0.5V$ Steady state voltage on the load = 0V

$I_1^- = 10mA$

2ns $V_2^+ = 0V$

$V_L(@1ms) = V_1^+ + V_1^- = 0V$
$t = \infty$ $= 0V$

I_G

20mA

10mA

1ms   2ns. t

I_L

20mA $(I_1^+ + I_1^-)$

1ms t

Example 2:

1Ω

1V ⌐   0V ⌐

V_S $+$ $Z_0 = 50\Omega$; $t_d = 1ms$ 0Ω V_L $+$ $-$

$\Gamma_S = \dfrac{1-50}{1+50} = -0.96$; $\Gamma_L = -1$

V_S V_L

$x = 0$ x

$V_1^+ = 0.98V$

1ms

$V_1^- = -0.98V$

2ns $V_2^+ = 0.941V$
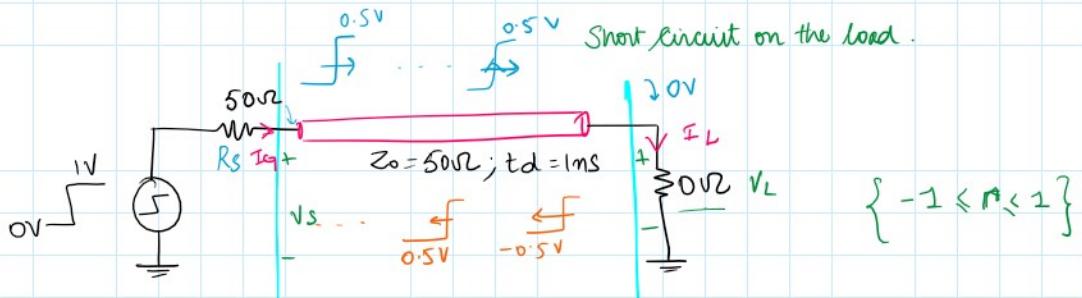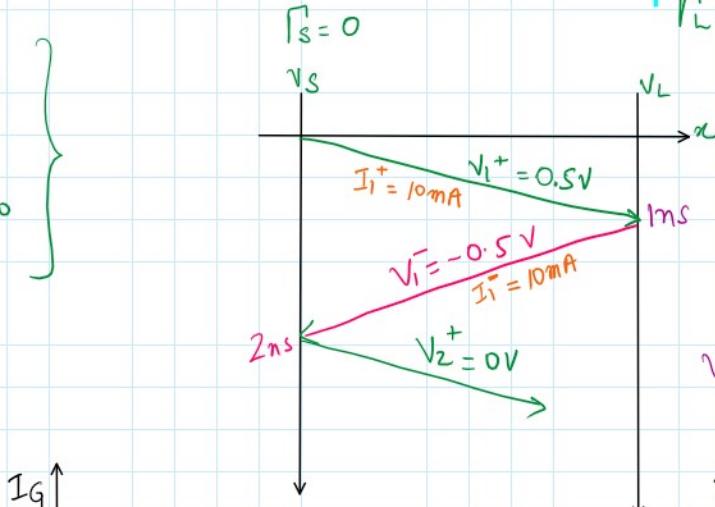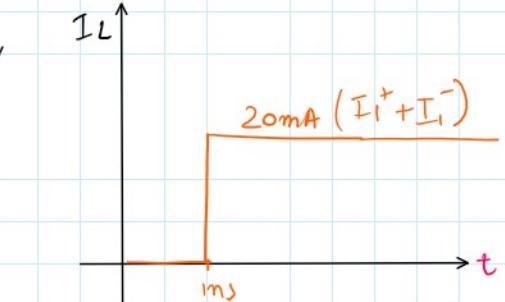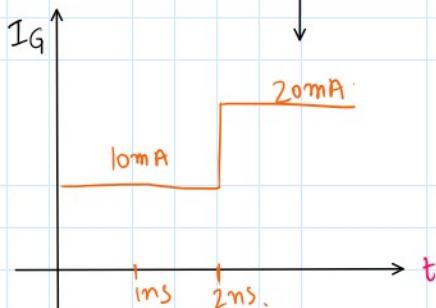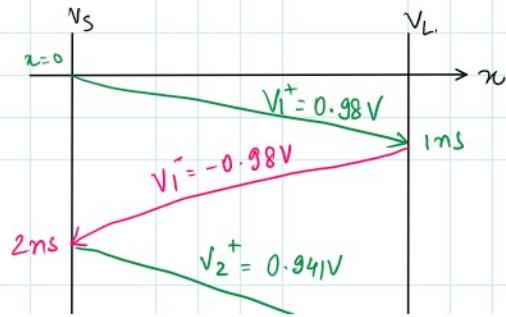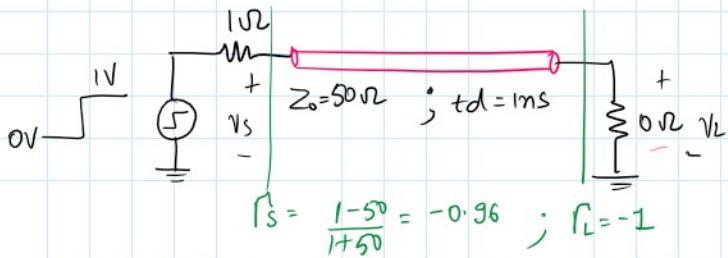
Observation : Very slow reduction of voltage at the generator toward 0V.

2ns

$V_2^+ = 0.941V$

3ns

$V_2^- = -0.941V$

4n

$V_3^+ = 0.905V$

t

of voltage at the generator toward 0V.

Example 4:

50Ω

1V

0V

V_s

$Z_0 = 50Ω ; t_d = 1ms$

$R_L = \infty \quad \overset{+}{\underset{-}{V_L}}$

$\Gamma_S = 0$

$\boxed{\Gamma_L = 1}$

$\Gamma_L = \dfrac{R_L - Z_0}{R_L + Z_0} = \dfrac{1 - Z_0/R_L}{1 + Z_0/R_L}$

$\lim\limits_{R_L \to \infty} \dfrac{1 - Z_0/R_L}{1 + Z_0/R_L} = 1$

V_s

V_L

x

$I_1^+ = 10mA \quad V_1^+ = 0.5V$

1ns

$V_1^- = 0.5V$

$I_1^- = -10mA$

2ns

$\Gamma_L = \dfrac{V^-}{V^+}$

$V^- = \Gamma_L \cdot V^+$

t

t

V_L

1V

1ms

t

V_s

1V

0.5V

1ms   2ns

t
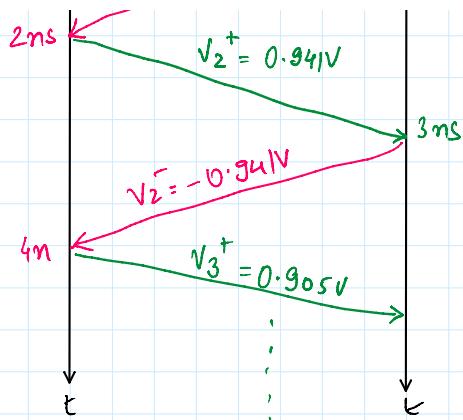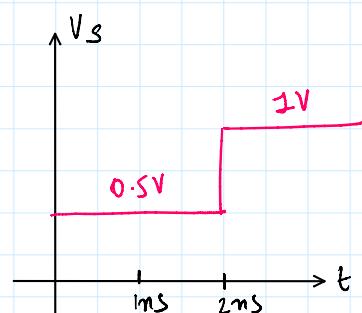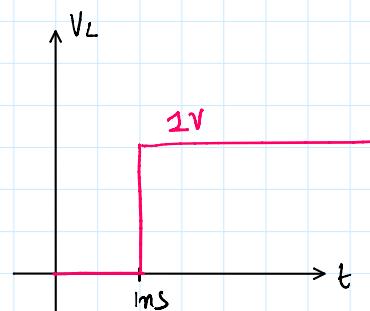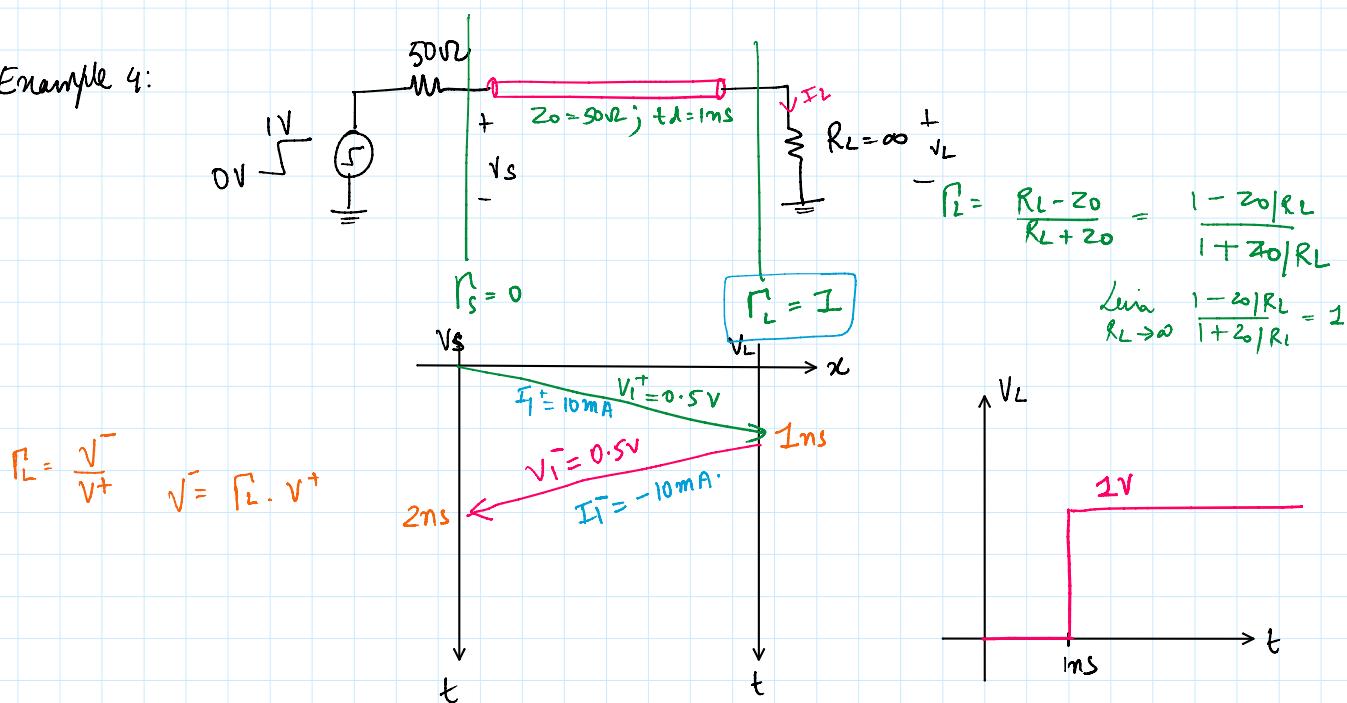
Reflections at the junction of transmission lines.

50Ω

1.5V

$Z_0 = 50Ω \; t_d = 500ps$

Line A

$Z_0 = 25Ω ; t_d = 200ps$

Line B

100Ω

$1.5V$

$0V$

Line A

Line B

100Ω

$\Gamma_G = 0$

Γ_{AB}

$\Gamma_{BA} = \dfrac{50-25}{50+25} = \dfrac{1}{3}$; $\Gamma_L = \dfrac{100-25}{100+25} = \dfrac{3}{5}$

$\Gamma_{AB} = \dfrac{25-50}{25+50} = -\dfrac{1}{3}$

Observation: $\Gamma_{AB} = -\Gamma_{BA}$