Problem P4.3

A break in a high-voltage DC power line occurs at $z = 0$ at time $t = 0$, as shown in Fig.2. The line was carrying a DC voltage V_o and DC current I_o before the break occurred. Assume that the tree is non-conducting.

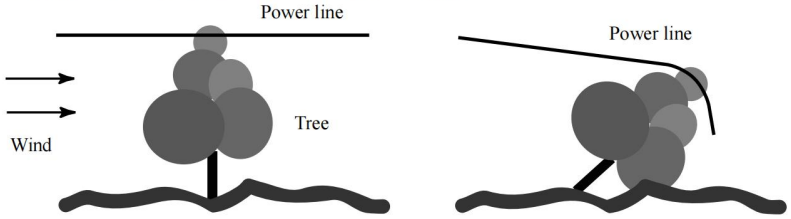

Fig. 2

(a) Sketch I and V on the line at some time t after the break has occurred, but before any reflections from the source and load ends. The characteristic impedance of the line is Z_0.

(b) Consider a 600 kV line, carrying a power of 10^3 megawatts, with a characteristic impedance of $500\,\Omega$ (two-wire line). What is the peak voltage on the line after the break occurs?

Problem P4.4

A very long transmission line with characteristic impedance Z_0 and wave velocity $v = c$ has a shunt resistor of unknown vlue R_L at an unknown location $z = \ell$. A measurement of the voltage at the input, $V_0(t)$, with a unit step generator applied to the line, yields the result shown in Fig. 3.

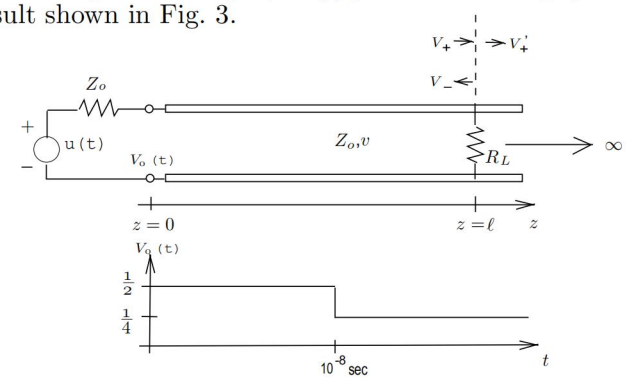

Fig. 3

(a) What is ℓ?

(b) What is R_L?

(c) Sketch the voltage and current distribution on the line at the time $t = 1.5\ell/v$.