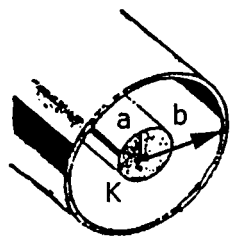
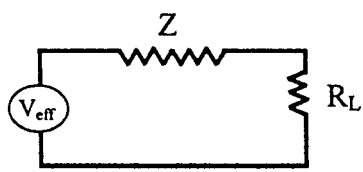
EM 7a1199B

A physicist discovered that the signal from her coaxial cable of length $\ell = 200\ m$ did not excite the test circuit inside her experimental apparatus. The cable terminated with a load resistance $R_L = 50\Omega$. In order to find the location and the nature of the fault, she sent a short positive pulse of height $V_i = 0.5V$. She used a function generator with an output impedence equal to the cable impedance $Z = 50\Omega$ and watched the signal on the oscilloscope. She found, on the oscilloscope display, the same polarity and same height pulse V_r after $500\ ns$ from the test pulse.

The coaxial cable is constructed such that the speed of voltage and current waves in the cable is 2×10^8 m/s.



(a) Show that the sketch shown below represents the equivalent electric circuit of the experiment. Determine V_{eff} in terms of V_i.



(b) Determine the amplitude of the reflected pulse V_r if the cable has no fault.

(c) What was the nature of the fault (open-circuit, short circuit) and where was it located?