Unit-V

Travelling Wave

Termination Through Capacitor

$$v(s) = \frac{2(1/Cs)}{Z_c + 1/Cs}\frac{v_f}{s} = \frac{2v_f}{s}\frac{1}{Z_c C_s + 1}$$

$$= \frac{2v_f}{s}\frac{1/Z_c C}{s + 1/Z_c C} = 2v_f \frac{1}{s} - \frac{1}{s + 1/Z_c C}$$

$$So:$$

$$v(t) = 2v_f(1 - e^{-t/Z_c C})$$

$$i(t) = \frac{2v_f}{Z_c} e^{-t/Z_c C}$$

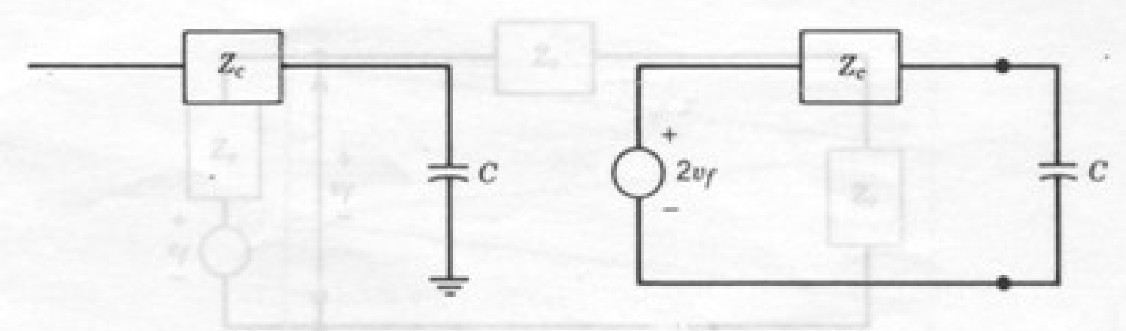
$$v_b(t) = v_f(1 - 2e^{-t/Z_c C})$$

Termination Through Capacitor

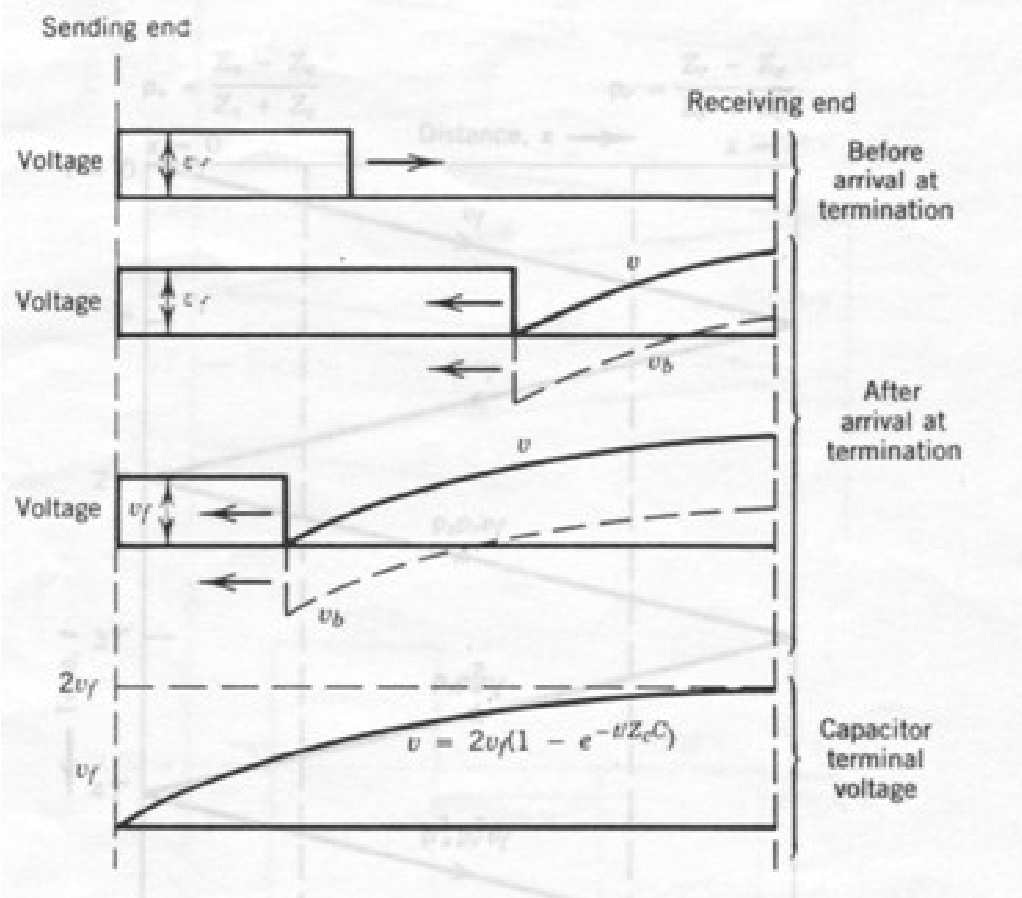
$$\tau = \frac{2Z}{Z + Z_c}$$

$$\tau = \frac{2(1/Cs)}{Z_c + 1/Cs}$$

$$v = \tau v_f$$



(a) (b)



Sending end
Receiving end
Voltage
Before
arrival at
termination
Voltage
v
v_b
After
arrival at
termination
v
Voltage
v_f
v_b
2v_f
Capacitor
terminal
voltage
v = 2v_f(1 - e^{-t/Z_cC})
v_f

Termination Through Inductor

$$v(t) = 2v_f e^{-(Z_c/L)t}$$

$$i(t) = \frac{2v_f}{Z_c}(1 - e^{-(Z_c/L)t})$$

$$v_b(t) = v(t) - v_f(t)$$

$$v_b(t) = v_f(2e^{-(Z_c/L)t} - 1)$$

Junction of Two Line

$$i_f = \frac{v_f}{Z_{c1}}$$

$$i_b = \frac{v_b}{Z_{c1}}$$

$$i = \frac{v}{Z_{c2}}$$

Junction of Two Line

$$v_f + v_b = v$$

$$i_f + i_b = i$$

$$\frac{v_f}{Z_{c1}} - \frac{v_b}{Z_{c1}} = \frac{v}{Z_{c2}}$$

$$2v_f = \left(1 + \frac{Z_{c1}}{Z_{c2}}\right)v$$

$$P_f = \frac{v_f^2}{Z_{c1}}$$

$$P = \frac{v^2}{Z_{c2}}$$

$$P_b = \frac{v_b^2}{Z_{c1}}$$

$$v = \frac{2Z_{c2}}{Z_{c1} + Z_{c2}} v_f$$

$$i = \frac{2Z_{c1}}{Z_{c1} + Z_{c2}} i_f$$

$$v_b = \frac{Z_{c2} - Z_{c1}}{Z_{c1} + Z_{c2}} v_f$$

$$i_b = \frac{Z_{c1} - Z_{c2}}{Z_{c1} + Z_{c2}} i_f$$

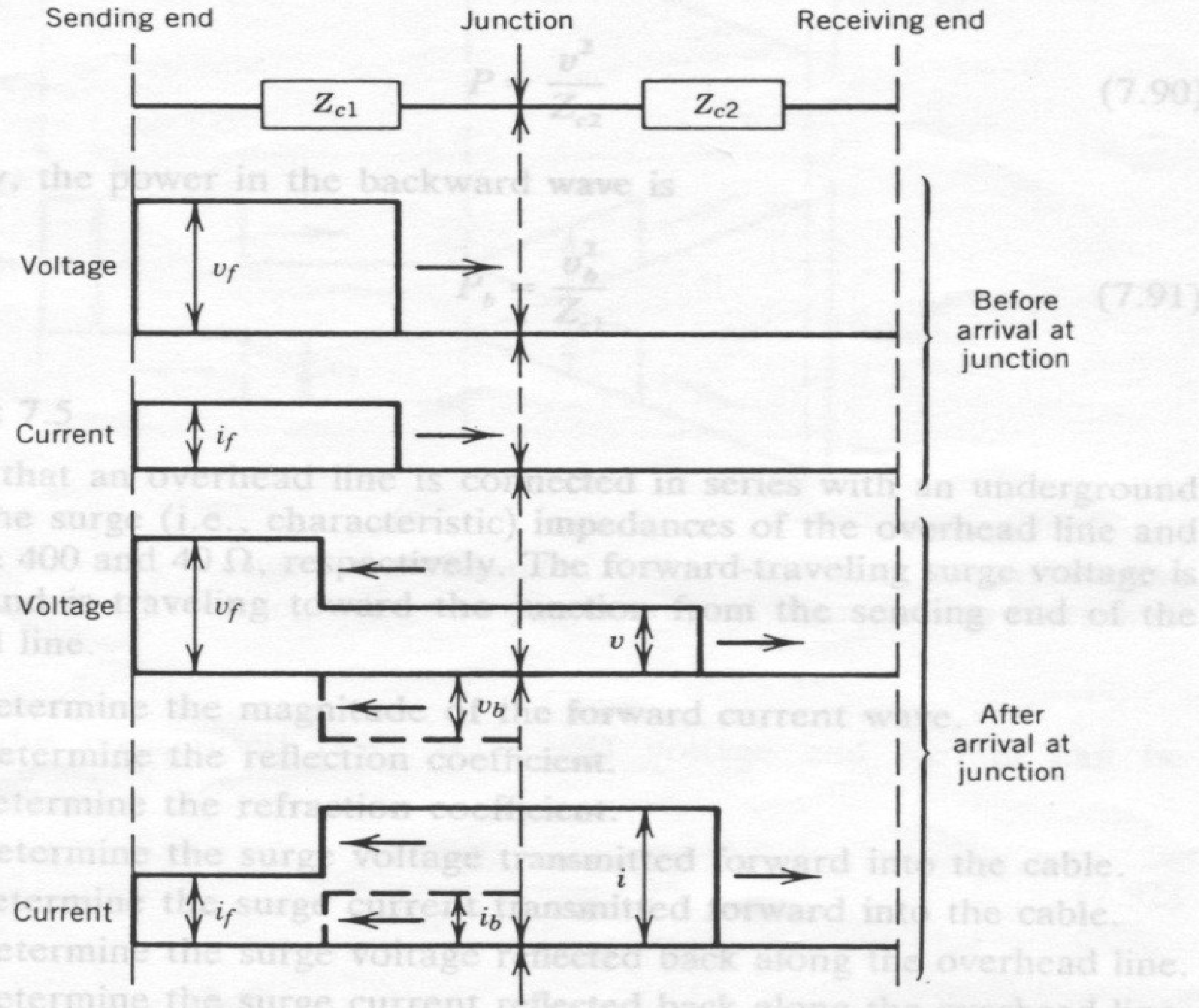


Figure 7.7. Traveling voltage and current waves being reflected and transmitted at junction between two lines.

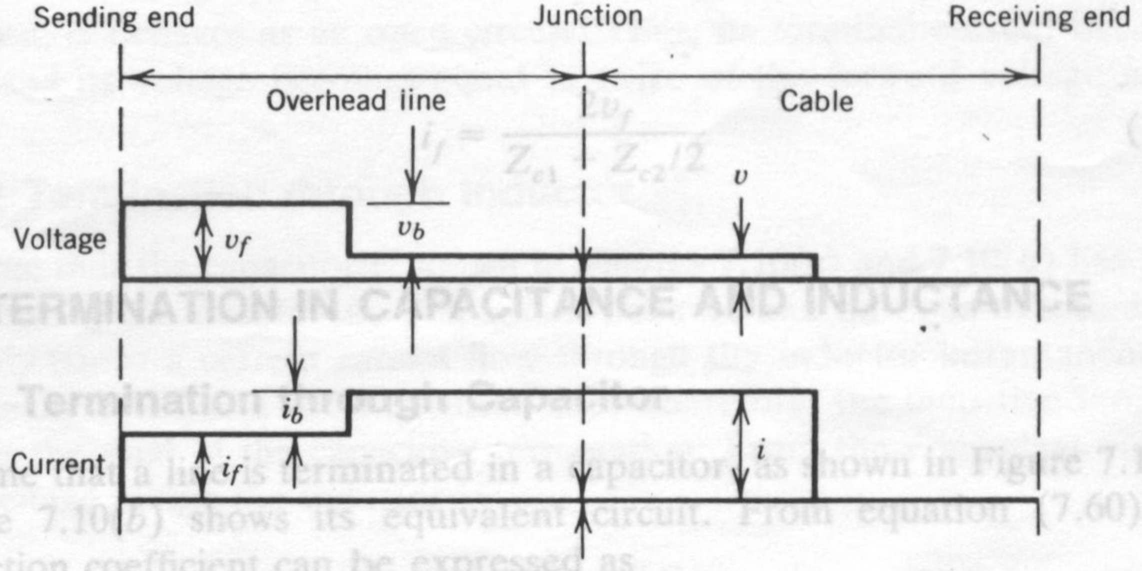

Sending end
Junction
Receiving end
Overhead line
Cable
Voltage
Current
v_f
v_b
v
i_b
i_f
i

Figure 7.8

Thanks