$$V(z,t) = \text{Re}\left[V_s e^{j\omega t}\right] \quad \text{[V]}$$

$$\gamma = \alpha + j\beta \quad \text{[1/m]}$$

$$\alpha = \text{Re}[\gamma] \quad \text{[Np/m]}$$

$$\beta = \text{Im}[\gamma] \quad \text{[rad/m]}$$

$$\beta = \frac{\omega}{u} = \frac{2\pi}{\lambda} \quad \text{[rad/m]}$$

$$\omega = 2\pi f \quad \text{[rad/s]}$$

$$\lambda = \frac{u}{f} \quad \text{[m]}$$

$$\delta = \frac{1}{\sqrt{\pi f \mu_c \sigma_c}}$$

$$R = \frac{1}{2\pi\delta\sigma_c}\left[\frac{1}{a} - \frac{1}{b}\right] \text{ [}\Omega\text{/m]}$$

$$L = \frac{\mu}{2\pi}\ln\frac{b}{a} \text{ [H/m]}$$

$$G = \frac{2\pi\sigma}{\ln(b/a)} \text{ [S/m]}$$

$$C = \frac{2\pi\varepsilon}{\ln(b/a)} \text{ [F/m]}$$

$$\gamma = \sqrt{(R + j\omega L)(G + j\omega C)} \quad \text{[1/m]}$$

$$Z_0 = \sqrt{\frac{R + j\omega L}{G + j\omega C}} \quad [\Omega]$$

$$\Gamma_{_L} = \frac{Z_L - Z_0}{Z_L + Z_0}$$

$$\Gamma_{_L} = |\Gamma_{_L}| e^{j\theta_r}$$

$$Z_{in} = Z_0\left[\frac{Z_L + Z_0\tanh\gamma l}{Z_0 + Z_L\tanh\gamma l}\right] \quad [\Omega]$$

$$V_0^+ = \left(\frac{Z_{in}}{Z_g + Z_{in}}\right)\frac{V_g}{e^{\gamma l} + \Gamma_{_L} e^{-\gamma l}} \quad \text{[V]}$$

$$V_s(z) = V_0^+\left(e^{-\gamma z} + \Gamma_{_L} e^{\gamma z}\right) \quad \text{[V]}$$

$$I_s(z) = \frac{V_0^+}{Z_0}\left(e^{-\gamma z} - \Gamma_{_L} e^{\gamma z}\right) \quad \text{[A]}$$

$$\gamma = j\beta = j\omega\sqrt{LC} \text{ [rad/m]}$$

$$Z_0 = \sqrt{\frac{L}{C}} \text{ [}\Omega\text{]}$$

$$Z_{in} = Z_0\left[\frac{Z_L + jZ_0\tan\beta l}{Z_0 + jZ_L\tan\beta l}\right] \quad [\Omega]$$

$$V_0^+ = \left(\frac{Z_{in}}{Z_g + Z_{in}}\right)\frac{V_g}{e^{j\beta l} + \Gamma_{_L} e^{-j\beta l}} \quad \text{[V]}$$

$$V_s(z) = V_0^+\left(e^{-j\beta z} + \Gamma_{_L} e^{j\beta z}\right) \quad \text{[V]}$$

$$I_s(z) = \frac{V_0^+}{Z_0}\left(e^{-j\beta z} - \Gamma_{_L} e^{j\beta z}\right) \quad \text{[A]}$$

$$|V_s|_{max} = |V_0^+|(1 + |\Gamma_{_L}|) \quad \text{[V]}$$

$$|V_s|_{min} = |V_0^+|(1 - |\Gamma_{_L}|) \quad \text{[V]}$$

$$s = \frac{|V_s|_{max}}{|V_s|_{min}} = \frac{1 + |\Gamma_{_L}|}{1 - |\Gamma_{_L}|}$$

$$Z_{in}^{sc} = jZ_0\tan\beta l \quad [\Omega]$$

$$Z_{in}^{oc} = -jZ_0\cot\beta l \quad [\Omega]$$

$$Z_0 = \sqrt{Z_{in}^{sc}\cdot Z_{in}^{oc}} \quad [\Omega]$$

$$Z_{in}' = \frac{Z_0'^2}{Z_L} \quad [\Omega] \quad (\lambda/4 \text{ transformer})$$

$$P_{L_{avg}} = \frac{1}{2}\frac{|V_0^+|^2}{Z_0}(1 - |\Gamma_{_L}|^2) \quad \text{[W]}$$