8.2.

(a). $\vec{E_t} = \frac{A}{\rho}\hat{\rho}$.

$\vec{B_t} = \sqrt{\mu\varepsilon}\cdot\hat{z}\times\vec{E_t} = \sqrt{\mu\varepsilon}\frac{A}{\rho}\hat{\phi}$. $\Rightarrow \vec{S} = \frac{1}{2}\vec{E}\times\vec{H}^* = \frac{1}{2}\sqrt{\frac{\mu}{\varepsilon}}|H_0|^2\frac{a^2}{\rho^2}\hat{z}$.

$\Rightarrow \vec{H_t} = \sqrt{\frac{\varepsilon}{\mu}}\frac{A}{\rho}\hat{\phi} = H_0\frac{a}{\rho}\hat{\phi}$.

$P = \int\vec{S}\cdot\hat{z}\,da = \frac{|H_0|^2a^2}{2}\sqrt{\frac{\mu}{\varepsilon}}\int\frac{1}{\rho}d\phi d\rho$.

$= \pi|H_0|^2a^2\sqrt{\frac{\mu}{\varepsilon}}\ln\frac{b}{a}$.

(b). $\frac{dP}{dz} = -2\gamma P$.

$-\frac{dP}{dz} = \frac{1}{2\sigma\delta}\oint|\hat{n}\times\vec{H}|^2dl = \frac{1}{2\sigma\delta}|H_0|^2\oint\frac{a^2}{\rho^2}dl = \frac{\pi}{\sigma\delta}|H_0|^2(a+\frac{a^2}{b})$

$\rightarrow \gamma = \frac{-1}{2P}\frac{dP}{dz} = \frac{a+\frac{a^2}{b}}{2\sigma\delta\sqrt{\frac{\mu}{\varepsilon}}a^2\ln\frac{b}{a}} = \frac{1}{2\sigma\delta}\sqrt{\frac{\varepsilon}{\mu}}\frac{\frac{1}{a}+\frac{1}{b}}{\ln\frac{b}{a}}$.

(c).

$U = -\int_a^b\vec{E}\cdot d\vec{l} = -\int_a^b\sqrt{\frac{\mu}{\varepsilon}}H_0\frac{a}{\rho}d\rho = a\sqrt{\frac{\mu}{\varepsilon}}H_0\ln\frac{a}{b}$.

$I = \oint_c|\vec{K}|dl = H_0 2\pi a$

$Z_0 = \left|\frac{U}{I}\right| = \frac{1}{2\pi}\sqrt{\frac{\mu}{\varepsilon}}\ln\frac{b}{a}$.

(d). $\frac{1}{2}I^2R = -\frac{dP}{dz}$. $\rightarrow R = \left|\frac{2dP}{I^2dz}\right| = \frac{2|H_0|^2\pi(a+\frac{a^2}{b})}{4\pi^2a^2|H_0|^2\sigma\delta} = \frac{\frac{1}{a}+\frac{1}{b}}{2\pi\sigma\delta}$.

$U = \frac{\mu}{4}\int|\vec{H}|^2da = \frac{\mu}{4}|H_0|^2\cdot2\pi\cdot a^2\int_a^b\frac{1}{\rho}d\rho = \frac{\pi\mu}{2}|H_0|^2a^2\ln\frac{b}{a}$.

$\frac{1}{4}LI^2 = U + 2\pi a\int\frac{\mu}{4}H_{\parallel}e^{-\xi/\delta}e^{i\xi/\delta} + 2\pi b\int\frac{\mu}{4}H_{\parallel}e^{-\xi/\delta}e^{i\xi/\delta}\cdot|\frac{a}{b}|^2$

$= U + \frac{\mu\delta\pi}{4}|H_0|^2(a+\frac{a^2}{b})$

$\rightarrow L = \frac{\mu\ln(\frac{b}{a})}{2\pi} + \frac{\mu\delta}{4\pi}(\frac{1}{a}+\frac{1}{b})$.