

$$\frac{c_f}{b} = \left\{ \frac{1}{2} \left[ s^2 + 1 + \sqrt{(s^2 + 1)^2 - 4s^2 \cos^2 \theta} \right] \right\}^{1/2}$$

$$\frac{c_s}{b} = \left\{ \frac{1}{2} \left[ s^2 + 1 - \sqrt{(s^2 + 1)^2 - 4s^2 \cos^2 \theta} \right] \right\}^{1/2}$$

$$\frac{b_n}{b} = |\cos \theta|$$

$$\theta = 0$$

$$n^2 = R$$

$$R = 1 - \frac{\omega_p^2}{\omega^2} \cdot \frac{\omega}{\omega + \Omega}$$

$$\vec{n} = \frac{c}{\omega} \vec{k}$$

$$\left( \frac{kc}{\omega^2} \right)^2 = 1 - \frac{\omega_p^2}{\omega} \frac{1}{\omega + \Omega}$$

$$(kc)^2 = \omega^2 - \frac{\omega_p^2 \omega}{(\omega + \Omega)}$$

$$\left( \frac{kc}{\Omega} \right)^2 = \left( \frac{\omega}{\Omega} \right)^2 - \frac{\omega_p^2 \omega}{\Omega^2 (\omega + \Omega)}$$

$$= \left( \frac{\omega}{\Omega} \right)^2 - \left( \frac{\omega_p}{\Omega} \right)^2 \frac{\frac{\omega}{\Omega}}{\left( \frac{\omega}{\Omega} + 1 \right)}$$

$$y = x^2 - k \frac{x}{x+1}$$

$$x = \frac{kc}{\Omega} \quad y = \frac{\omega}{\Omega}$$

$$\lambda = \omega_p / \Omega = 2.0$$

$$R = 1 - \frac{\omega_p^2}{\Omega^2 y^2} \frac{1}{1 + \frac{1}{y}} = 1 - \frac{\lambda^2}{y^2} \frac{1}{1 + \frac{1}{y}}$$

$$k_c = R x$$

$$\omega = \Omega y$$

$$L = 1 - \frac{\lambda^2}{y^2} \frac{1}{1 - \frac{1}{y}}$$

$$P = 1 - \frac{\lambda^2}{y^2}$$

$$S = \frac{R+L}{2} = \frac{1}{2} \left[ 2 - \frac{\lambda^2}{y^2} \left( \frac{1}{1+y} + \frac{1}{1-\frac{1}{y}} \right) \right]$$

$$= 1 - \frac{1}{1 - \frac{1}{y^2}}$$

$$\frac{1}{1 + \frac{1}{y}} - \frac{1}{1 - \frac{1}{y}} = \frac{1 - \frac{1}{y} - 1 - \frac{1}{y}}{1 - \frac{1}{y^2}} = \frac{-\frac{2}{y}}{1 - \frac{1}{y^2}}$$

$$D = 1 + \frac{\frac{1}{y}}{1 - \frac{1}{y^2}}$$

$$n = \frac{k_c}{\omega} = \frac{\Omega x}{\Omega y} = \frac{x}{y}$$

P R L S

$$\tan^2 \theta = - \frac{\left(1 - \frac{\lambda^2}{y^2}\right) \left(\left(\frac{x}{y}\right)^2 - 1 + \frac{\lambda^2}{y^2} \frac{1}{1 + \frac{1}{y}}\right) \left(\left(\frac{x}{y}\right)^2 + \frac{\lambda^2}{y^2} \frac{1}{1 - \frac{1}{y}}\right)}{\left(1 - \frac{1}{1 - \frac{1}{y^2}}\right) \left(\frac{x}{y}\right)^2 - \left(1 - \frac{\lambda^2}{y^2} \frac{1}{1 + \frac{1}{y}}\right) \left(1 - \frac{\lambda^2}{y^2} \frac{1}{1 - \frac{1}{y}}\right) \left(\left(\frac{x}{y}\right)^2 - \left(1 - \frac{\lambda^2}{y^2}\right)\right)}$$