

EE 451
Butterworth Filter Design

$$\delta_p = 1 - 10^{-R_{pass}/20}$$

$$\delta_s = 10^{-R_{stop}/20}$$

$$\epsilon = \sqrt{\frac{2\delta_p - \delta_p^2}{(1 - \delta_p)^2}}$$

$$\gamma = \sqrt{\frac{1 - \delta_s^2}{\delta_s^2}}$$

$$N = \frac{\log(\gamma/\epsilon)}{\log(\Omega_{stop}/\Omega_{pass})}$$

$$\Omega_c = \Omega_{stop} (\gamma)^{-1/N}$$

or

$$\Omega_c = \Omega_{pass} (\epsilon)^{-1/N}$$

N poles at

$$s_k = \Omega_c e^{j(\frac{\pi}{2})} e^{j\pi(\frac{2k+1}{2N})}, \quad k = 0, 1, \dots, N - 1$$

N zeros at infinity