

**Transformada ZOH de sistema de 2ª ordem subamortecido:**

$$G(s) = K_s \frac{\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2} \xrightarrow[ZOH]{T_s} G(z) = K_s \frac{b_0 z^{-1} + b_1 z^{-2}}{1 + a_1 z^{-1} + a_2 z^{-2}}$$

Tabela 2.1, de transformadas ZOH, na pág. 55 do livro de Astrom e Wittenmark (Computer-Controlled Systems):

$$\omega = \omega_n \sqrt{1 - \zeta^2} \text{ se } \zeta < 1$$

$$\alpha = e^{-\zeta\omega_n T_s}$$

$$\beta = \cos(\omega T_s)$$

$$\gamma = \sin(\omega T_s)$$

$$b_0 = 1 - \alpha \left( \beta + \frac{\zeta\omega_n}{\omega} \gamma \right)$$

$$b_1 = \alpha^2 + \alpha \left( \frac{\zeta\omega_n}{\omega} \gamma - \beta \right)$$

$$a_1 = -2\alpha\beta$$

$$a_2 = \alpha^2$$