

$$\left[s(JL_a + BL_a) + R_a(Ts + B) + K_m K_b \right] \omega(s) = K_m E_a(s)$$

$$G(s) = \frac{\omega(s)}{E_a(s)} = \frac{K_m}{JL_a s^2 + (JR_a + BL_a)s + (R_a B + K_m K_b)}$$

$$\approx \frac{K_o}{s^2 + 2\zeta\omega_n s + \omega_n^2}$$

$$K_o = \frac{K_m}{JL_a}$$

$$\omega_n^2 = \frac{R_a B + K_m K_b}{JL_a}$$

$$2\zeta\omega_n = \frac{JR_a + BL_a}{JL_a}$$