Motor & Load

Using Parameters from Config. 1

$$J_m = J_a + J_L\left(\frac{25}{250}\right)^2 = 0.02 + \left(\frac{25}{250}\right)^2 = 0.03$$

$$D_m = D_a + D_L\left(\frac{25}{250}\right)^2 = 0.01 + \left(\frac{25}{250}\right)^2 = 0.02$$

$$\frac{\Theta_m(s)}{E_a(s)} = \frac{K_t/(R_a J_m)}{s\left[s + \frac{1}{J_m}\left(D_m + \frac{K_t K_b}{R_a}\right)\right]} = \frac{0.5/(8*0.03)}{s\left[s + \frac{1}{0.03}\left(0.02 + \frac{0.5*0.5}{8}\right)\right]}$$

$$\frac{\Theta_m(s)}{E_a(s)} = \frac{25/12}{s^2 + s\frac{41}{24}} = \frac{50}{24s^2 + 41s}$$

Gears

$$\frac{\Theta_o(s)}{E_a(s)} = 0.1\,\frac{\Theta_m(s)}{E_a(s)} = \frac{5}{24s^2 + 41s}$$

$P_{cr} = 490\ ms = 0.49\ s$

$$\frac{\Theta_o(s)}{E_a(s)} = \frac{5}{24s^2 + 41s}$$

$J_m = 0.03\ kg\text{-}m^2$

$D_m = 0.02\ N\text{-}m\ s/rad$