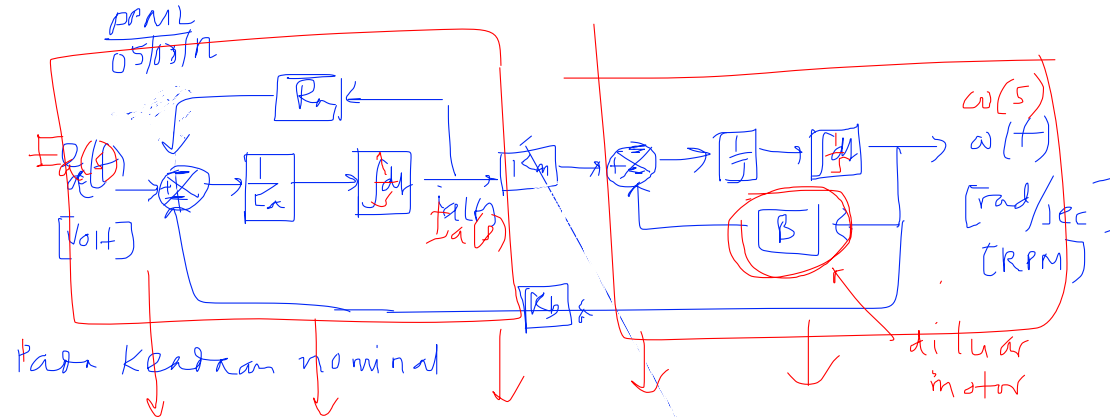


$$G(s) = \frac{\omega(s)}{E_a(s)} = \frac{K_m}{L_a J s^2 + (B L_a + R_a) s + (B R_a + K_m K_b)}$$

$$H(s) = \frac{I_a(s)}{E_a(s)} = \frac{I_a(s)}{\omega(s)} \frac{\omega(s)}{E_a(s)} = \frac{J s + B}{K_m} G(s) = \frac{J s + B}{L_a J s^2 + (B L_a + R_a)}$$



Transf. Laplace

$$\left(\frac{L_a J s^2 + (B L_a + R_a) s + (B R_a + K_m K_b)}{K_m} \right) I_a(s) = \frac{1}{L_a s} [E_a(s) - K_b \omega(s) - R_a I_a(s)]$$

$$K_m I_a(s) = \frac{1}{J s} [E_a(s) - K_b \omega(s) - R_a I_a(s)]$$

$$J s \omega(s) = K_m I_a(s) - B \omega(s)$$

$$(J s + B) \omega(s) = K_m I_a(s) \rightarrow I_a(s) = \frac{(J s + B) \omega(s)}{K_m}$$

$$\frac{(J s + B) \omega(s)}{K_m} = \frac{1}{L_a s} [E_a(s) - K_b \omega(s) - R_a \frac{(J s + B) \omega(s)}{K_m}]$$

$$\left[\frac{J s + B}{K_m} + \frac{K_b + R_a (J s + B)}{L_a s K_m} \right] \omega(s) = \frac{1}{L_a s} E_a(s)$$

$$\left[\frac{J s + B}{K_m} + \frac{K_b + R_a (J s + B)}{L_a s K_m} \right] \omega(s) = \frac{1}{L_a s} E_a(s)$$

$$\frac{L_a s (J s + B)}{K_m} \omega(s) = E_a(s) - K_b \omega(s) - R_a \frac{(J s + B) \omega(s)}{K_m}$$

$$\left[\frac{L_a J s^2 + B L_a s}{K_m} + K_b + \frac{R_a J s + B R_a}{K_m} \right] \omega(s) = E_a(s)$$

$$G(s) = \frac{\omega(s)}{E_a(s)} =$$

$$\frac{K_m}{L_a J s^2 + (B L_a + R_a) s + \frac{B R_a + K_m K_b}{K_m}}$$