Prep 13

Prove

$$RJ\dot{\omega}(t) = -(Rf + K_v K_a)\omega(t) + K_a u_A(t).$$

(3.1) $u_A(t) = \lambda \frac{di(t)}{dt} = Ri(t) + k_v \omega(t)$

(3.2) $K_a i(t) = J\dot{\omega}(t) + f\omega(t) \Rightarrow i(t) = \frac{J\dot{\omega}(t) + f\omega(t)}{K_a}$

$i(t)$ i 3.1

$$u_A(t) = \lambda \frac{d}{dt}\left(\frac{J\dot{\omega}(t) + f\omega(t)}{K_a}\right) + R\left(\frac{J\dot{\omega}(t) + f\omega(t)}{K_a}\right) + k_v \omega(t)$$

Försummar $\lambda = 0$

$$\Longrightarrow u_A(t) = R\,\frac{J\dot{\omega}(t) + f\omega(t)}{K_a} + k_v \omega(t) \Longleftrightarrow$$

$$\Longleftrightarrow K_a u_A(t) = R(J\dot{\omega}(t) + f\omega(t)) + K_a K_v \omega(t) \Longrightarrow$$

$$\Longrightarrow RJ\dot{\omega}(t) = -(Rf + k_a k_v)\omega(t) + k_a u_A(t) \quad \square$$

Prep 14 $RJ\dot{\omega}(t) = -(Rf + k_v k_a)\omega(t) + K_a U_A(t)$

$$\Longleftrightarrow \dot{\omega}(t) + \left(\frac{Rf + k_v k_a}{RJ}\right)\omega(t) = \frac{K_a}{RJ} u_A(t) \quad \left(\dot{\omega}(t) + \frac{1}{T}\omega(t) = K U_A(t)\right).$$

$$\Longrightarrow T = \frac{RJ}{Rf + k_v k_a}, \quad K = \frac{K_a}{RJ},$$

Prep 15 $T = \frac{RJ}{Rf + k_v k_a} \Longleftrightarrow J = \frac{T(Rf + k_v k_a)}{R}$