

3^{ème} partie: Asservissement de vitesse:

III. 1.1. La fonction de transfert $H(p) = \frac{\Omega(p)}{U(p)}$

$$U = R_a I_a + L_a \frac{dI_a}{dt} + E \text{ avec: } E = K\phi\Omega \Rightarrow U = R_a I_a + L_a \frac{dI_a}{dt} + K\phi\Omega$$

$$J \frac{d\Omega}{dt} + f\Omega = C_{em} - C_r \overset{10}{\Rightarrow} C_{em} = K\phi I_a \Rightarrow J \frac{d\Omega}{dt} + f\Omega = K\phi I_a$$

On passe en Laplace on obtient: $U(p) = R_a I_a(p) + L_a p I_a(p) + K\phi\Omega(p)$

$$Jp\Omega(p) + f\Omega(p) = K\phi I_a(p) \Rightarrow I_a(p) = \frac{(Jp + f)\Omega(p)}{K\phi}$$

$$U(p) = (R_a + L_a p) \cdot \frac{(Jp + f)\Omega(p)}{K\phi} + K\phi\Omega(p)$$

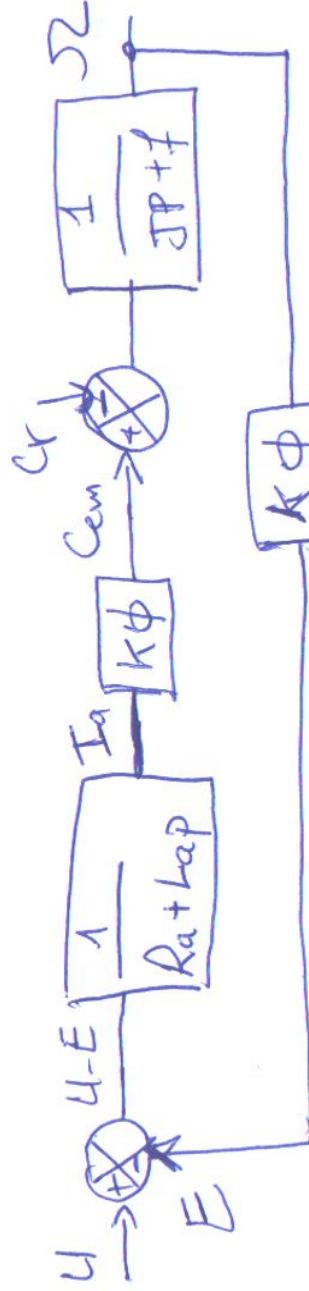
$$U(p) = \left[\frac{(R_a + L_a p)(Jp + f)}{K\phi} + K\phi \right] \Omega(p)$$

$$\frac{\Omega(p)}{U(p)} = \frac{K\phi}{K\phi^2 + (R_a + L_a p)(Jp + f)} = \frac{K\phi}{K\phi^2 + (R_a J + L_a f)p + L_a J p^2}$$

III. 1.2. $H(p)$ sous forme: $H(p) = \frac{K}{1 + a_1 p + a_2 p^2}$

$$H(p) = \frac{K\phi}{K\phi^2 + (R_a J + L_a f)p + L_a J p^2} = \frac{1/K\phi}{1 + \left(\frac{R_a J + L_a f}{K\phi}\right)p + \frac{L_a J}{K\phi} p^2}$$

donc: $K = \frac{1}{K\phi}$, $a_1 = \frac{R_a J + L_a f}{K\phi}$, $a_2 = \frac{L_a J}{K\phi}$



2^e partie : Etude du convertisseur :

II. 1.1. Vallée de la tension $U(t) \cdot E$ en fonction du temps

$$T = \frac{1}{f}, \quad \alpha = \frac{T_{ON}}{T}$$

II. 1.2. La valeur moyenne $U_{moy} \cdot E$ de $U(t)$:

$$U_{moy} = \int_0^{\alpha T} U(t) dt - \int_{\alpha T}^T U(t) dt = \alpha E - (1 - \alpha) \cdot E = (2\alpha - 1)E$$

II. 1.3: $U_{moy} = (2\alpha - 1)E \Rightarrow 2\alpha - 1 \geq 0$ donc $\alpha \geq \frac{1}{2}$
 $U_{moy} > 0$ si $\alpha \geq \frac{1}{2}$ et $U_{moy} < 0$ si $\alpha < \frac{1}{2}$

II. 1.4: Quadrant

regime fonct

fig 3a → ①

Moteur

fig 3b → ②

Generateur

fig 3c → ③

Moteur (sens inverse)

fig 3d → ④

Generateur.

Exemple: $f = 200 \text{ Hz}$, $T = \frac{1}{200} = 0,005 \text{ s}$, $T_{ON} = 0,003$, $E = 200 \text{ V}$

$$\alpha = \frac{T_{ON}}{T} = \frac{0,003}{0,005} = 0,6 \quad , \quad U_{moy} = (2\alpha - 1)E = (2 \times 0,6 - 1) \times 200 = 40 \text{ V}$$