Contrôle n°: 01

Asservissement et Régulation

Ex. n° 01 :–

1. $$H(P) = \frac{1}{3P+2} = \frac{K}{\tau P + 1} = \frac{1/2}{\frac{3}{2}P + 1} \quad \begin{cases} K = \frac{1}{2} \\ \tau = \frac{3}{2} \end{cases}$$ 1

2. $$H(P) = \frac{1}{P^2 + 3P + 2} = \frac{K\omega_n^2}{P^2 + 2\varepsilon\omega_n P + \omega_n^2}$$

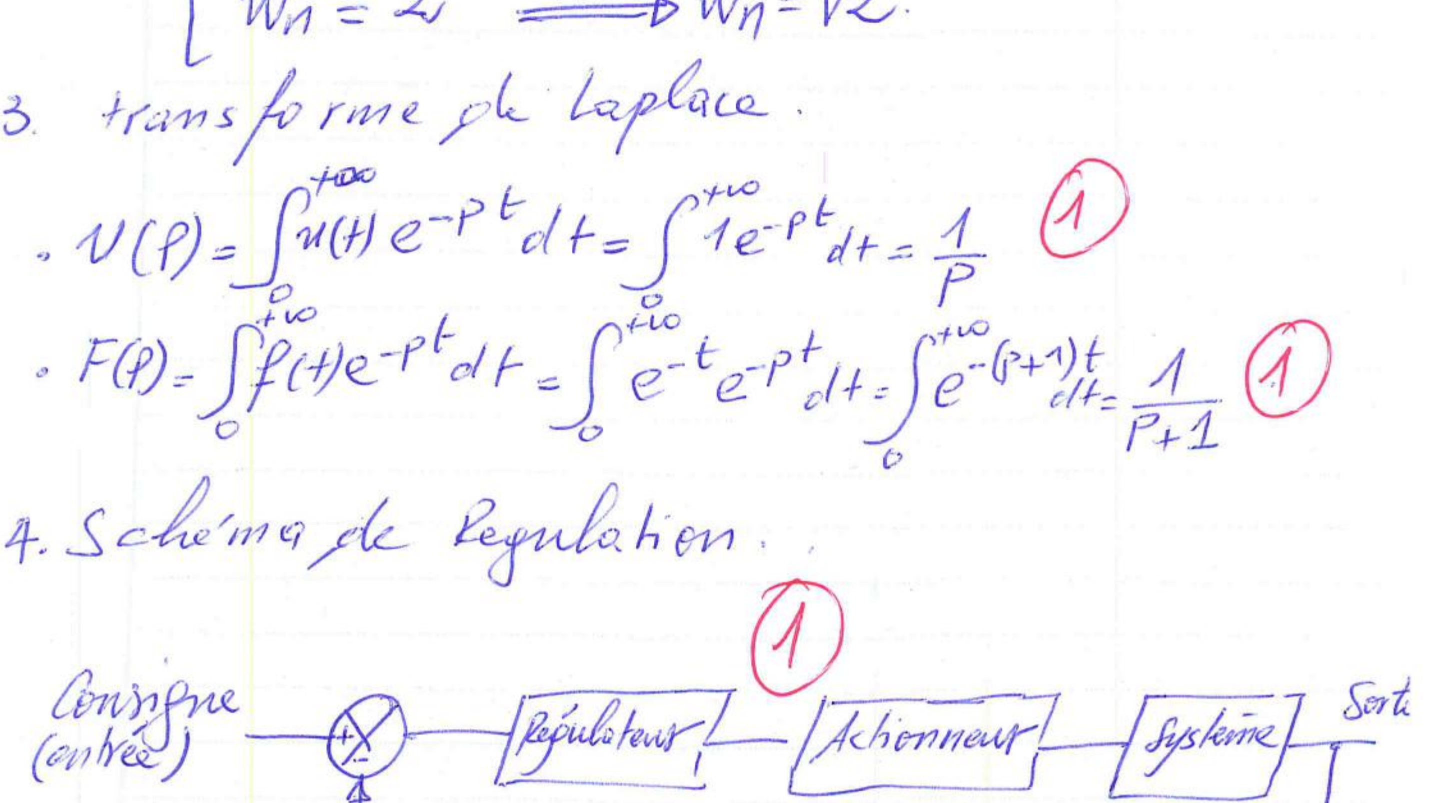
$$\begin{cases} K\omega_n^2 = 1 \Longrightarrow K = \frac{1}{2} \\ 2\varepsilon\omega_n = 3 \Longrightarrow \varepsilon = \frac{3}{2\omega_n} = \frac{3}{2\sqrt{2}} \\ \omega_n^2 = 2 \Longrightarrow \omega_n = \sqrt{2}. \end{cases}$$ 2

3. transformé de Laplace.

- $U(P) = \int_0^{+\infty} u(t) e^{-pt} dt = \int_0^{+\infty} 1 e^{-pt} dt = \frac{1}{P}$ 1
- $F(P) = \int_0^{+\infty} f(t) e^{-pt} dt = \int_0^{+\infty} e^{-t} e^{-pt} dt = \int_0^{+\infty} e^{-(p+1)t} dt = \frac{1}{P+1}$ 1

4. Schéma de Régulation.

1



Exercice n° 02 Conditions initiales nulles...

1./ $\dfrac{d^2 s(t)}{dt^2} + 2\dfrac{ds(t)}{dt} + s(t) = \dfrac{de(t)}{dt} + e(t)$

Fonction de transfert $G(P) = \dfrac{S(P)}{E(P)}$

$$P^2 S(P) + 2P S(P) + S(P) = P E(P) + E(P)$$

$$(P^2 + 3P + 1)\, S(P) = (P+1)\, E(P)$$

$$\boxed{G(P) = \frac{S(P)}{E(P)} = \frac{P+1}{P^2 + 2P + 1}}$$ 2

2/ $\dfrac{d^2 s(t)}{dt^2} + 3\dfrac{ds(t)}{dt} + 2s(t) = 5e(t)$

$$P^2 S(P) + 3P S(P) + 2 S(P) = 5E(P)$$

$$(P^2 + 3P + 2)\, S(P) = 5\, E(P).$$

$$\boxed{G(P) = \frac{S(P)}{E(P)} = \frac{5}{P^2 + 3P + 2}}$$ 2

Exercice n° 03 : Stabilité (critère de Routh)

$D(P) = P^4 + P^3 + 3P + P + 1.$

P^4	1	3	1
P^3	1	1	
P^2	2	1	
P^1	0,5	0	
P^0	1		

3 Système Stable

2. $D_1(p) = p^5 + 2p^4 + 3p^3 + 4p^2 + 3p + 1$.

p^5	1	3	3
p^4	2	4	1
p^3	1	2,5	0
p^2	-1	1	0
p^1	3,5	0	
p^0	1		

3

Système instable

Exercice n° 04

1/

$$\sum \vec{F} = M\vec{\gamma} \Rightarrow \sum F = M\frac{d^2x(t)}{dt^2}$$ 1

$$F(t) - Kx(t) - h\frac{dx}{dt} = M\frac{d^2x(t)}{dt^2}$$

$$\boxed{M\frac{d^2x(t)}{dt^2} + h\frac{dx(t)}{dt} + Kx(t) = F(t)}$$ 2

2/

$$M\frac{d^2x(t)}{dt^2} + h\frac{dx(t)}{dt} + Kx(t) = F(t)$$

$$Mp^2X(p) + hpX(p) + KX(p) = F(p)$$

$$\boxed{H(p) = \frac{X(p)}{F(p)} = \frac{1}{Mp^2 + hp + K}}$$ 1