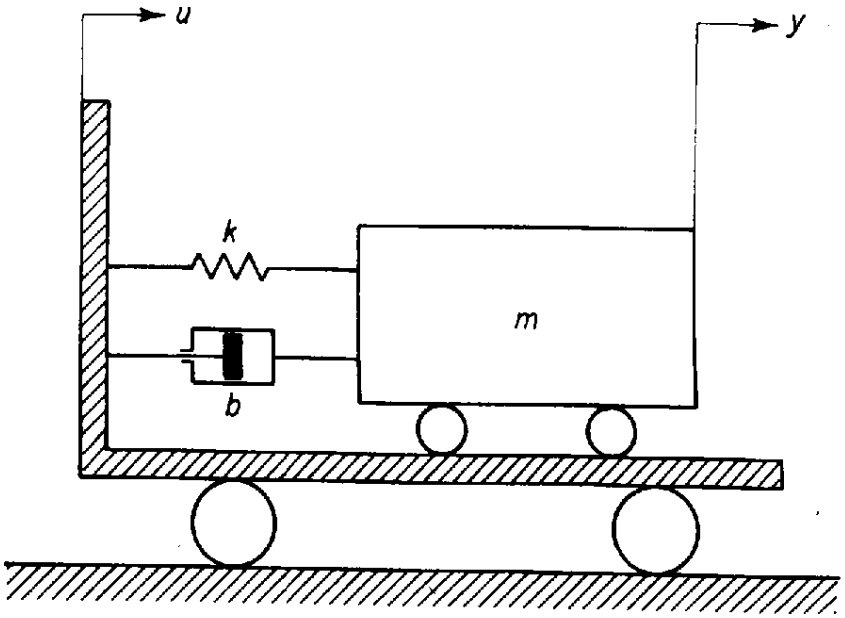
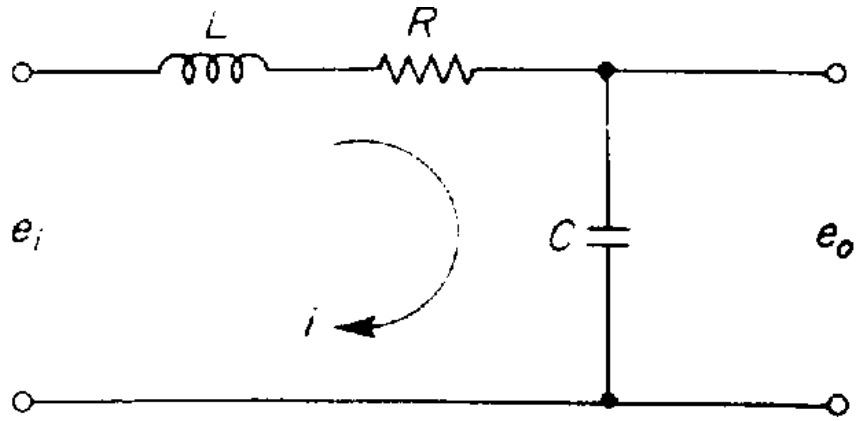
SISTEMES MECÀNICS



$$G(s) = \frac{Y(s)}{U(s)} = \frac{bs + k}{ms^2 + bs + k}$$

Newton: $\sum F = ma$ ➔ $$m\frac{d^2y}{dt^2} = -b\left(\frac{dy}{dt} - \frac{du}{dt}\right) - k(y - u)$$

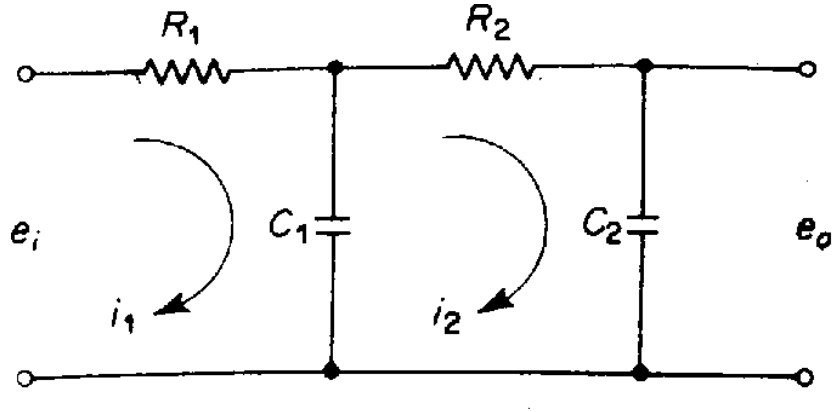
SISTEMES ELÈCTRICS



$$L\frac{di}{dt} + Ri + \frac{1}{C}\int idt = e_i$$

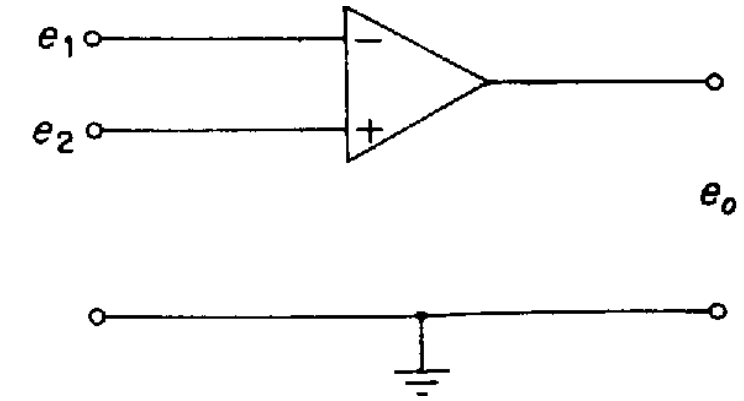
$$\frac{1}{C}\int idt = e_o$$

$$\frac{E_o(s)}{E_i(s)} = \frac{1}{LCs^2 + RCs + 1}$$

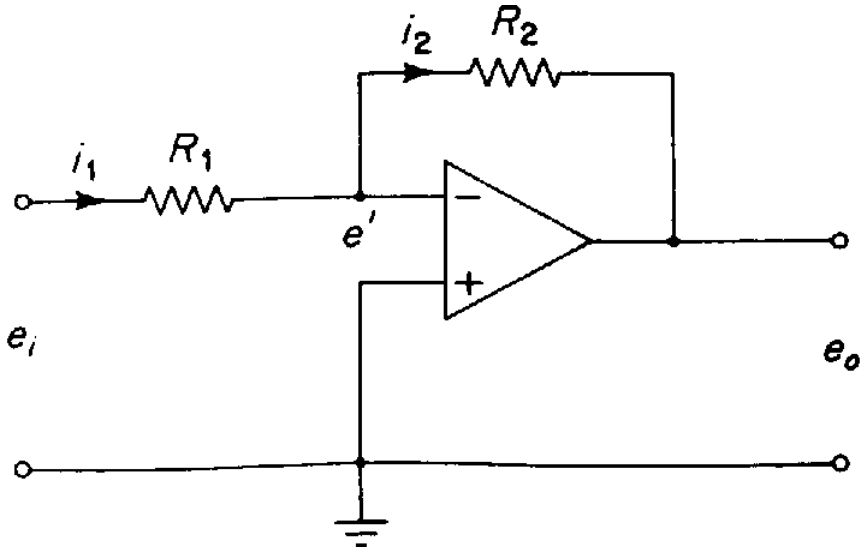


$$\frac{E_o(s)}{E_i(s)} = \frac{1}{(R_1C_1s + 1)(R_2C_2s + 1) + R_1C_2s}$$

SISTEMES ELÈCTRICS

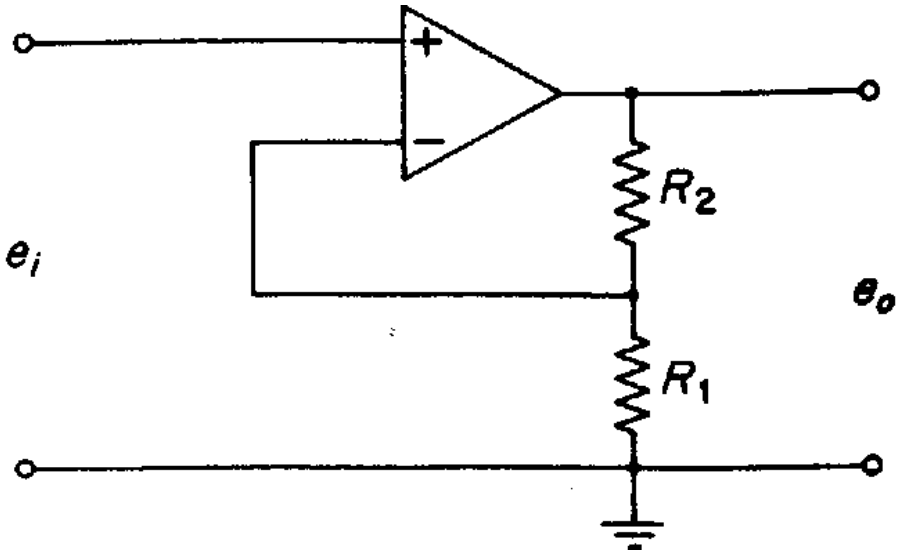


$$e_o = K\,(e_2 - e_1)$$



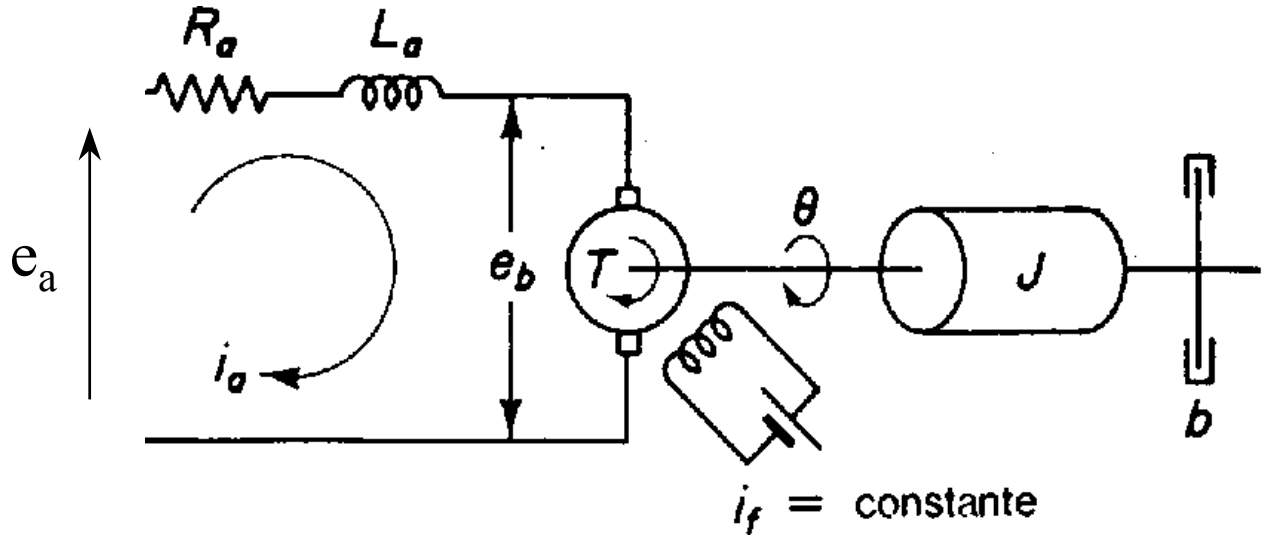
$$e_o = -\frac{R_2}{R_1} e_i$$

SISTEMES ELÈCTRICS



$$e_o = \left(1 + \frac{R_2}{R_1}\right) e_i$$

SISTEMES ELECTROMECÀNICS



Ra = resist. de l'armadura, ohms
La = inductància de l'armad., henrys
ia = corrent a l'armadura, ampers
if = corrent de camp, ampers
ea = tensió d'armadura, volts
eb = força contra-electromotriu, volts
θ = desplaçament angular de l'eix del motor, radians

T = parell del motor, N-m
J = moment d'inèrcia equivalent del motor i càrrega en referència a l'eix del motor, kg-m^2
b = coef. de fricció viscosa equivalent del motor i càrrega amb referència a l'eix del motor, N-m/(rad/seg)

SISTEMES ELECTROMECÀNICS

$$\psi = K_f i_f$$

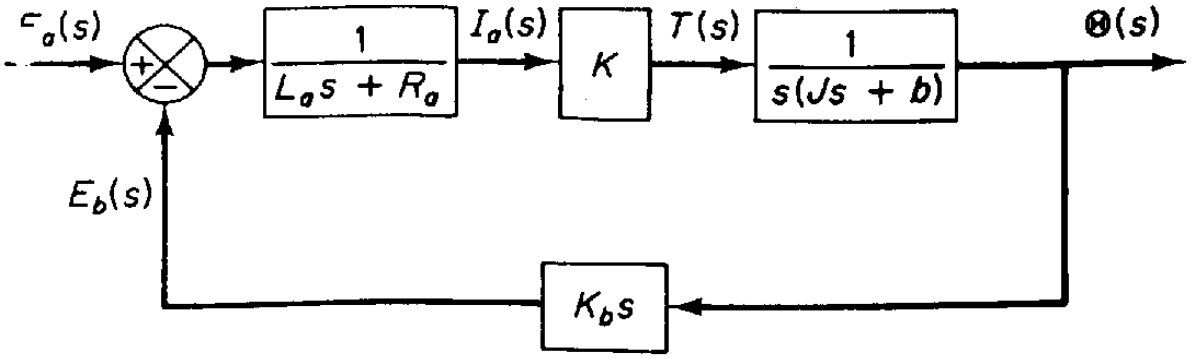
$$T = K_f i_f K_1 i_a$$

$$T = K i_a$$

$$e_b = K_b \frac{d\theta}{dt}$$

$$L_a \frac{di_a}{dt} + R_a i_a + e_b = e_a$$

$$J \frac{d^2\theta}{dt^2} + b \frac{d\theta}{dt} = T = K i_a$$

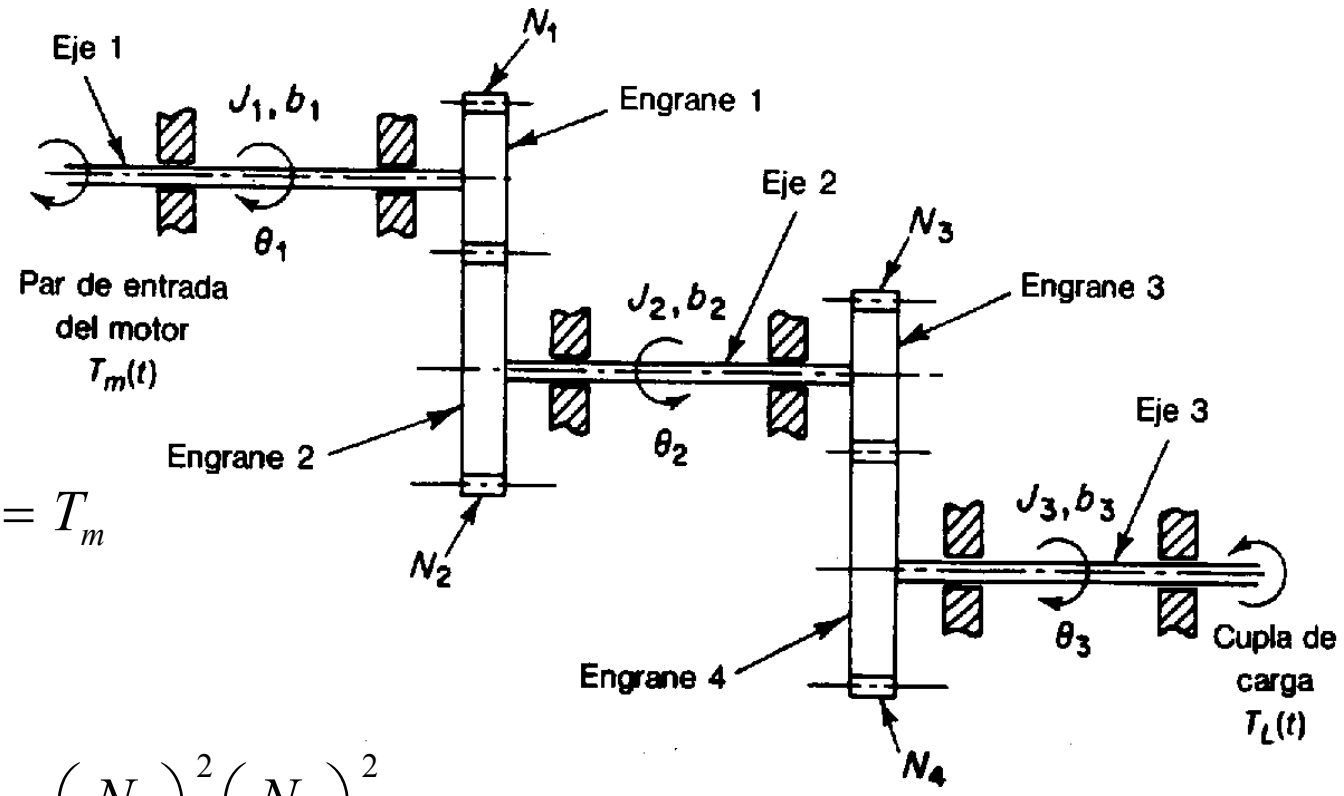


(b)

$$\frac{\Theta(s)}{E_a(s)} = \frac{K}{s\left[L_a J s^2 + (L_a b + R_a J)s + R_a b + K K_b\right]}$$

$$L \cong 0$$

$$\frac{\Theta(s)}{E_a(s)} = \frac{K_m}{s\left(T_m s + 1\right)}$$

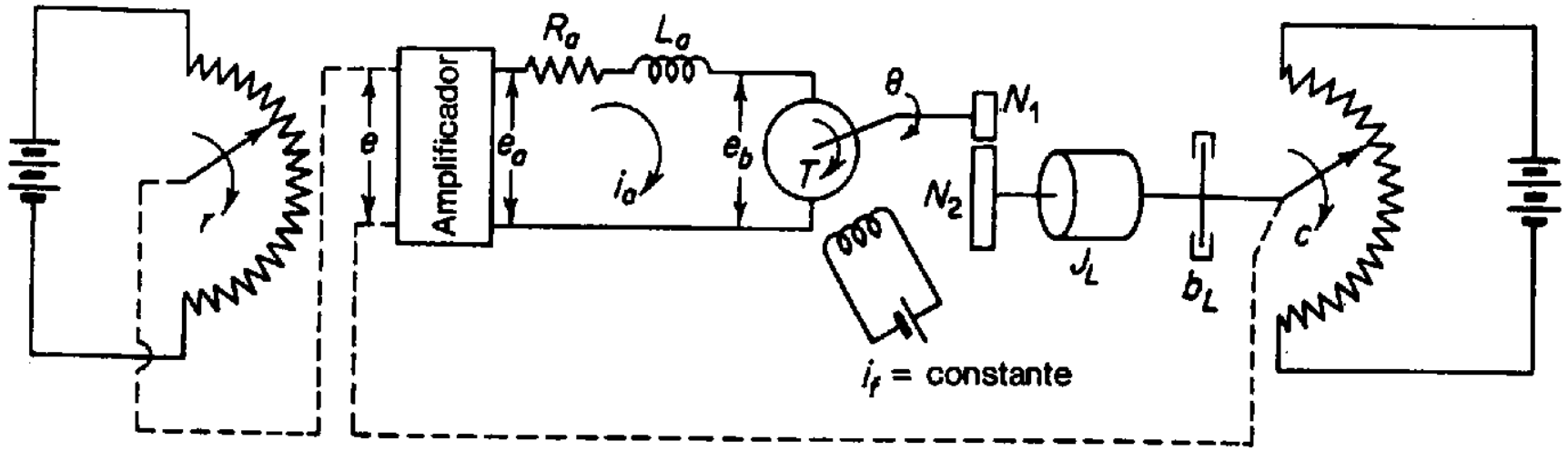


$$J_{1eq}\ddot{\theta}_1 + b_{1eq}\dot{\theta}_1 + nT_L = T_m$$

$$n = \frac{N_1}{N_2}\frac{N_3}{N_4}$$

$$J_{1eq} = J_1 + \left(\frac{N_1}{N_2}\right)^2 J_2 + \left(\frac{N_1}{N_2}\right)^2 \left(\frac{N_3}{N_4}\right)^2 J_3$$

$$b_{1eq} = b_1 + \left(\frac{N_1}{N_2}\right)^2 b_2 + \left(\frac{N_1}{N_2}\right)^2 \left(\frac{N_3}{N_4}\right)^2 b_3$$



$K_1 = 24/\pi$ volts/rad
$K_p = 10$ volts/volts
$R_a = 0.2$ ohms
L_a = despreciable
$K_b = 5.5$ e-2 volts-seg/rad
$K = 6$ e-5 N-m/amper
$J_m = 1$ e-5 kg-m^2
b_m = despreciable

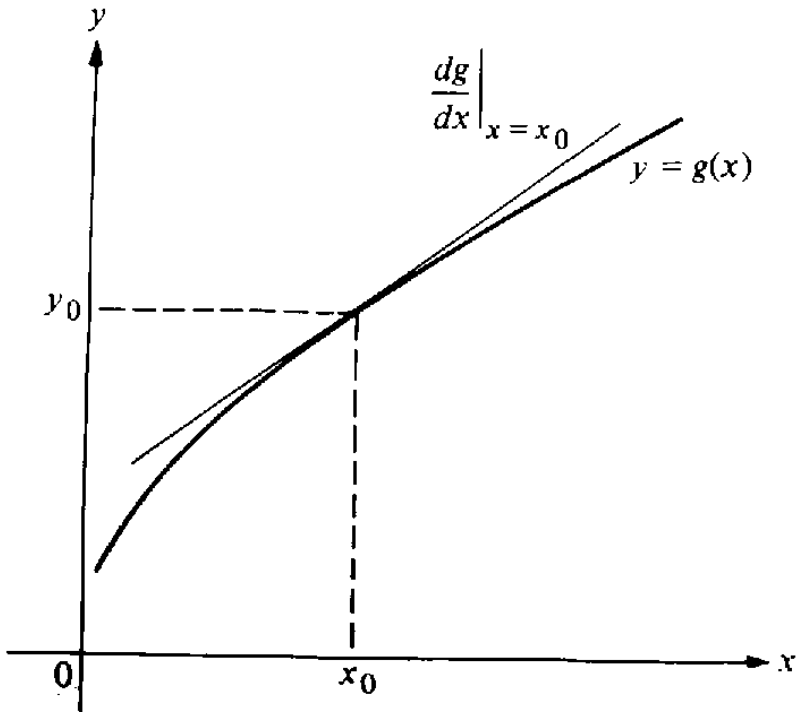
$J_L = 4.4$ e-3 kg-m^2
$b_L = 4$ e-7 N-m/(rad/seg)
$n = N_1/N_2 = 1/10$

$$\frac{\Theta(s)}{E_a(s)} = \frac{0.72}{s(0.13s+1)}$$

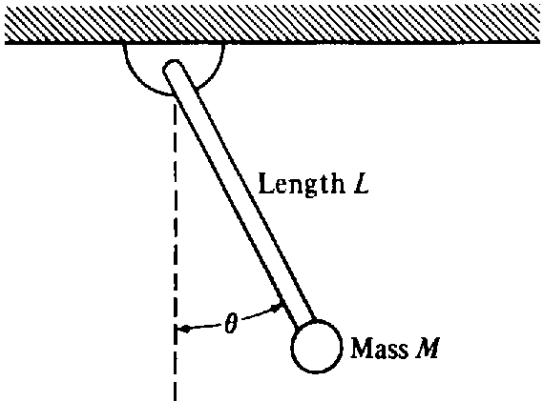
$$\frac{C(s)}{R(s)} = \frac{42.3}{s^2 + 7.69s + 42.3}$$

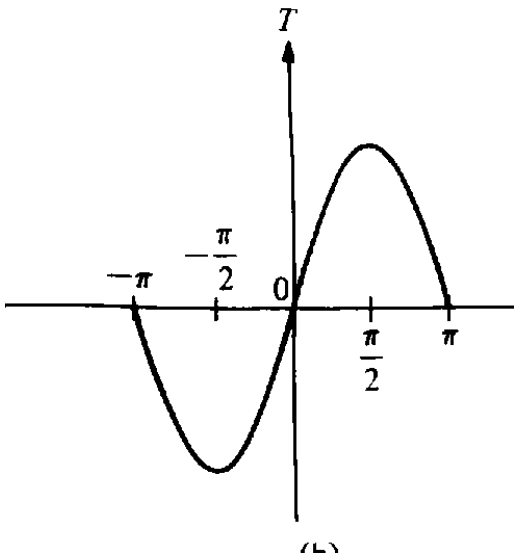
APROXIMACIONS LINEALS

$$y = g(x) = g(x_0) + \left.\frac{dg}{dx}\right|_{x=x_0} \frac{(x - x_0)}{1!} + \left.\frac{d^2g}{dx^2}\right|_{x=x_0} \frac{(x - x_0)^2}{2!} + \cdots$$



APROXIMACIONS LINEALS





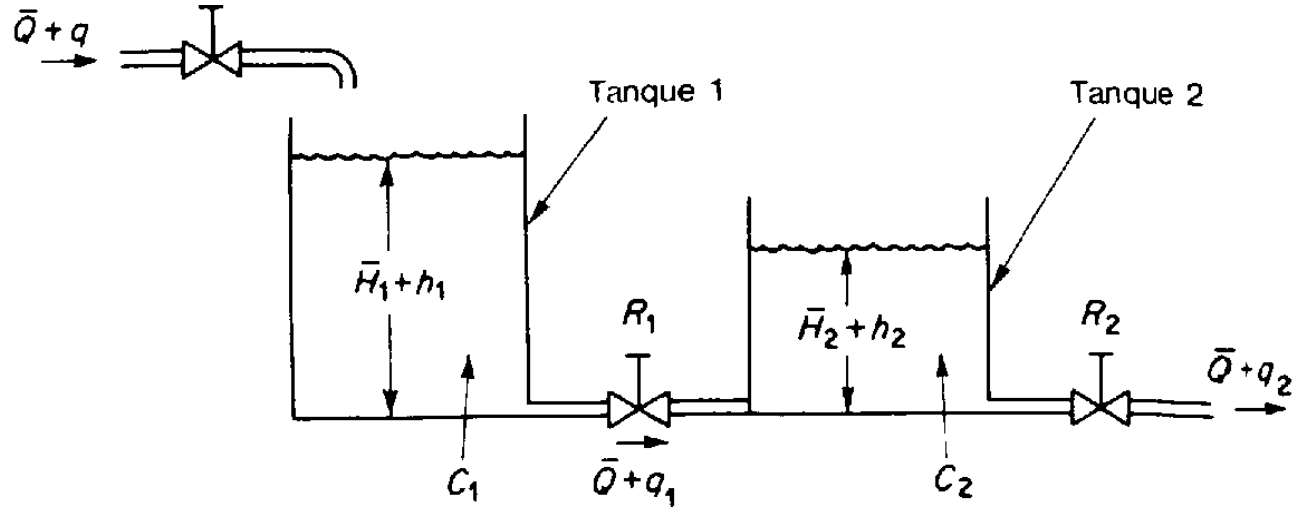
$$T = MgL \operatorname{sen}\theta$$

$$T = MgL \left.\frac{d(\operatorname{sen}\theta)}{dt}\right|_{\theta=\theta 0} (\theta - \theta 0)$$

$$T = MgL\left(\cos 0^{o}\right)\left(\theta - 0^{o}\right)$$

$$T = Mgl\theta$$

SISTEMES DE NIVELL DE LÍQUID



$$\frac{h_1 - h_2}{R_1} = q_1 \qquad \frac{h_2}{R_2} = q_2$$

$$C_1 \frac{dh_1}{dt} = q - q_1 \qquad C_2 \frac{dh_2}{dt} = q_1 - q_2$$