Scarica di un condensatore

$$\cancel{\mathcal{E}} - Ri(t) - \frac{Q(t)}{C} = 0$$

$$-R\frac{dQ(t)}{dt} = \frac{Q(t)}{C}$$

$$-RC\frac{dQ(t)}{dt} = Q(t)$$

$$\frac{dQ(t)}{Q(t)} = -\frac{dt}{RC}$$

$$\int \frac{dQ(t)}{Q(t)} = -\int \frac{dt}{RC}$$

$$\ln Q(t) = -\frac{t}{RC} + K$$

$$Q(t) = e^{-t/\tau + K}$$

$$Q(0) = Q_0 = e^{k}$$

$$Q(t) = Q_0\, e^{-t/\tau}$$

Energia solenoide

$$f = -L\frac{di}{dt}$$

$$dW = -dq\,\Delta V$$

$$dW = L\frac{di}{dt}\,dq = L\frac{dq}{dt}\,di$$

$$\frac{dq}{dt} = i$$

$$dW = L i\, di$$

$$\int_0^I dW = \int_0^I L\, i\, di$$

$$\int x\,dx = \frac{x^2}{2} + C$$

$$W = \left[L \frac{i^2}{2} \right]_0^I = L \frac{I^2}{2}$$

$$\int_a^b f(x)\,dx = F(b) - F(a)$$

$$\int_0^{\pi} \underbrace{3x^2}\ \underbrace{\cos x^3}\,dx = \left[\sin x^3 \right]_0^{\pi} =$$

$$= \sin \pi^3 - \cancel{\sin 0} = \sin \pi^3$$

Circuito RL

$$\mathcal{E} - Ri - L\frac{di}{dt} = 0$$

$$\mathcal{E} - Ri = L\frac{di}{dt}$$

$$\frac{dt}{L} = \frac{di}{\mathcal{E} - Ri}$$

$$\int \frac{dt}{L} = -\frac{1}{R}\int \frac{-R\,di}{\mathcal{E} - Ri}$$

$$\ln(\mathcal{E} - Ri) = -Rt/L + k$$

$$-t/L + k$$

$$\mathcal{E} - Ri = e$$

$$Ri = f - e^{-t^R/L + K}$$

$$i = \frac{f}{R} - \frac{1}{R} e^{-t^R/L + K}$$

$$i(0) = 0 \qquad \frac{f}{R} - \frac{1}{R} e^{K} = 0$$

$$e^K = f$$

$$i = \frac{f}{R} - \frac{f}{R} e^{-t^R/L} = \frac{f}{R}\left(1 - e^{-t^R/L}\right)$$

Moti rettilinei

$$a = a(t)$$

MRUA

$$v(t) = \int a\,dt = at + c$$

$$v = at + v_0$$

$$s(t) = \int v(t)\,dt = \int (at + v_0)\,dt =$$

$$= \frac{1}{2} a t^2 + v_0 t + \underbrace{k}_{s_0}$$

$$\mathcal{L} = \vec{F} \cdot \vec{s}$$

$$\vec{F} = -k\vec{x}$$

$$\mathcal{L} = \int kx\,dx = k\frac{x^2}{2} + c$$

$$\mathcal{E} = \int k\frac{q_1 q_2}{r^2}\,dr = q_1 q_2 k \int \frac{1}{r^2}\,dr =$$

$$= q_1 q_2 \frac{r^{-2+1}}{-2+1} + C =$$

$$= -\frac{q_1 q_2}{r} + C$$

$$E = E_0 \sin(kx - \omega t)$$

$$k = \frac{2\pi}{\lambda} \qquad \omega = 2\pi f$$

$$E(x,t) = E_0 \sin(kx - \omega t)$$

$E_0 = 10\ N/C$

$f = 20\ Hz$

$E = E_0 \sin(kx - \omega t)$

$k = \frac{2\pi}{\lambda}$ $\omega = 2\pi f =$

$= 6,28 \cdot 20 = 124\ \frac{rad}{s}$

$c = v = \frac{\lambda}{T} = \lambda f$ $\lambda = \frac{c}{f}$

$\lambda = \frac{3 \cdot 10^8}{2 \cdot 10} = 1,5 \cdot 10^7\ m$

$E = 10 \sin(4,18 \cdot 10^{-7} x - 124 t)$