FORMULÁRIO DE INTRODUÇÃO AOS SISTEMAS ELETROMAGNÉTICOS - ENGª BIOMÉDICA

Cálculo vetorial

Produto escalar	Produto vetorial
$\vec{a}\cdot\vec{b} = a\,b\cos(\theta)$ $\vec{a}\cdot\vec{b} = a_x b_x + a_y b_y + a_z b_z$	$\lvert\vec{a}\wedge\vec{b}\rvert = a\,b\,\mathrm{sen}(\theta)$ $\vec{a}\wedge\vec{b} = \begin{vmatrix} \hat{x} & \hat{y} & \hat{z} \\ a_x & a_y & a_z \\ b_x & b_y & b_z \end{vmatrix} = (a_y b_z - a_z b_y)\,\hat{x} + (a_z b_x - a_x b_z)\,\hat{y} + (a_x b_y - a_y b_x)\,\hat{z}$

Eletromagnetismo

$q_e = -1{,}6\times10^{-19}\,C$	$m_e = 9{,}1\times10^{-31}\,kg$	$\varepsilon_0 \simeq 8{,}854\times10^{-12}\,Fm^{-1}$	$\mu_0 = 4\pi\times10^{-7}\,H\,m^{-1}$	
$k = \dfrac{1}{4\pi\varepsilon_0} \simeq 8{,}988\times10^{9}$ N·m²C⁻²	$c = \dfrac{1}{\sqrt{\varepsilon_0\,\mu_0}} = 299792458\ m/s$			
Cargas pontuais	$\vec{E} = \dfrac{1}{4\pi\varepsilon_0}\dfrac{Q}{r^2}\,\hat{r}$	$V = \dfrac{1}{4\pi\varepsilon_0}\dfrac{q}{r} + C$		
	$\overrightarrow{F_{12}} = \dfrac{1}{4\pi\varepsilon_0}\dfrac{q_1\,q_2}{r_{12}^{\,2}}\,\hat{r}_{12}$	$U_{12} = \dfrac{1}{4\pi\varepsilon_0}\dfrac{q_1\,q_2}{r_{12}} + C$		
$V_c = \dfrac{Q}{C}$	$U_C = \dfrac{1}{2}QV$	$V_C = Ed$	$C = \varepsilon\dfrac{A}{d}$	
$i = \dfrac{dq}{dt} \Leftrightarrow q = \int i\,dt$	$V_R = Ri$	$P_R = Ri^2$	$R = \rho\dfrac{L}{A}$ $\rho = \rho_0 + \alpha\,\rho_0\,(T - T_0)$	
$V_L = L\dfrac{di}{dt}$	$U_L = \dfrac{1}{2}Li^2$	$x = x_0 + v_x t + \frac{1}{2}a_x t^2$		
$\vec{B} = \int \dfrac{\mu_0\, i\,\vec{dl}\wedge\hat{r}}{4\pi r^2}$	$\vec{B}_{\text{centro bobine}} = \dfrac{\mu_0 N i}{2a}\,\hat{z}$	$\vec{B}_{\text{eixo bobine}} = \dfrac{\mu_0 N i a^2}{2(a^2+L^2)^{3/2}}\,\hat{z}$		
$\vec{B}_{\text{fio rectilíneo infinito}} = \dfrac{\mu_0 i}{2\pi r}\,\hat{\theta}$	$B_{\text{interior solenóide}} = \dfrac{\mu_0 N i}{L}$	$B_{\text{interior toróide}} = \dfrac{\mu_0 N i}{2\pi r}$		
$\vec{F}_m = q\,\vec{v}\wedge\vec{B}$	$R = \dfrac{mv}{qB}$	$R = \dfrac{mv_\perp}{qB}$; $Passo = v_\parallel T$		
$\vec{F} = \int_L I\,\vec{dl}\wedge\vec{B}$	$\vec{F}_L = \vec{F}_e + \vec{F}_m = q\vec{E} + q\vec{v}\wedge\vec{B}$	$\vec{m} = N i A \hat{A}$	$\vec{\tau} = \vec{m}\wedge\vec{B}$	
$\phi = \iint \vec{B}\bullet\vec{dA}$	$\phi = Li$ [H]	$\phi_2 = M i_1$		
$fem = -\dfrac{d\phi}{dt}$	$fem = -L\dfrac{di}{dt}$	$fem_2 = -M\dfrac{di_1}{dt}$		
$\begin{cases} E = E_0 sen(kx - \omega t) \\ B = B_0 sen(kx - \omega t) \end{cases}$	$k = \dfrac{2\pi}{\lambda}$	$\omega = 2\pi\,f$	$\vec{S} = \dfrac{1}{\mu_0}\vec{E}\wedge\vec{B}$	$\bar{S} = \dfrac{E_0^{\,2}}{2\mu_0 c}$

$\Delta V = E\cdot\Delta S$
[V] [V/m] [m]

$|\Delta U_m| = |\Delta U_p + \Delta U_c|$
$= |q\Delta V + \frac{1}{2}m(v_f^2 - v_i^2)|$