ELECTROESTATICA

$k = \frac{1}{4\pi\varepsilon_0} \cong 9\times10^{9}$ $\varepsilon_0 = 8.85\times10^{-12}$

HOJA N°
FECHA

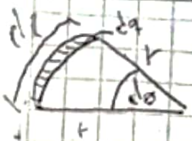
Campo E debido a q en un punto P

$$\vec{E} = \frac{k \cdot q}{r_P^2}\hat{r} \quad \left[\frac{N}{C}\right]$$

$dq = \lambda dx$

$$d\vec{E} = \frac{k \cdot dq}{|\vec{r}-\vec{r}'|^3}(\vec{r}-\vec{r}')$$

r: del origen al punto P $(x,0)$
r': del origen al dq $(x',0)$ a integrar
$\int_0^L$ longitud barra
(si el r no varía (radio) r sin nada) $\frac{k\,dq}{r^2}$



$dq = \lambda\, r\, d\theta$

$$F_{el} = \vec{E} \cdot q$$

$\sigma = \frac{dq}{ds}$; $\lambda = \frac{dq}{dl}$; $\rho = \frac{dq}{dv}$; $\lambda = \frac{Q}{S}$

Flujo (Gauss)

$$\phi_{el} = \int_S \vec{E} \cdot d\vec{s} \quad \left[\frac{N}{C}\right][m^2]$$

$$\phi_{neto} = \oint_{SG} \vec{E} \cdot d\vec{s} = \frac{Q_{neta}}{\varepsilon_0}$$

Potencial

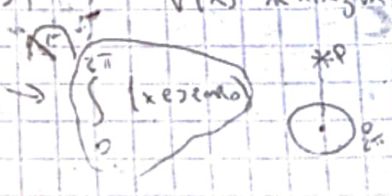
$$V_F - V_i = -\int_i^F \vec{F_{el}} \cdot d\vec{l}$$

$$\Delta U_{iF} = -q\int \vec{E} \cdot d\vec{l}$$ Variación energía.

$$V_P = \frac{k \cdot q}{r_P}$$ potencial carga puntual

$$V_P = \int \frac{k \cdot dq}{|\vec{r}-\vec{r}'|}$$

r': $(x',0)$
r: $(x,0)$
(te queda todo V(x) a integrar)
P-estático: $\int_0^{2\pi}$ (x ejemplo)



$$\Delta V_{a,b} = -\int_a^b \vec{E} \cdot d\vec{l}$$

$$W_{a\to b} = -q \cdot \Delta V_{a,b}$$

Corriente

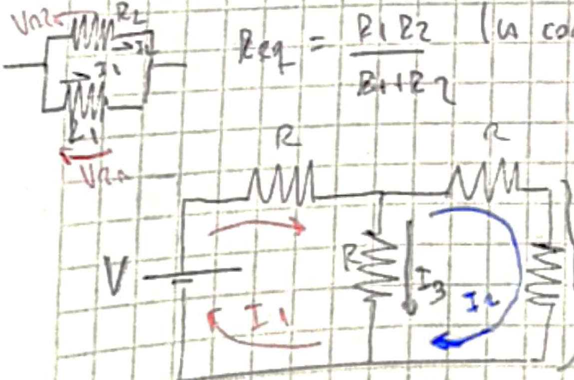
$$V = R \cdot I$$

$$P_{Resistor} = I^2 \cdot R = V_R \cdot I$$

$$P_{Fuente} = V \cdot I \ [Watt]$$

$R_{eq} = R_1 + R_2 + R_3$ (la corriente es la misma)

$R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$ (la corriente no es la misma) Pero $V_{R1} = V_{R2} = V$



[siempre] Así

Potencias Entregadas — Potencias Disipadas

$$P_{V1} + P_{V2} + P_{V3} = P_{R1} + P_{R2}$$

$V = V'$ (en paralelo) (con esto)

NOTA

CAPACITORES

$$C = \frac{Q}{V}$$

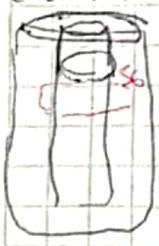
Esférico

$$\oint \vec{E}\cdot d\vec{S} = \frac{Q}{\varepsilon_0} \Rightarrow E\,4\pi r^2 = \frac{Q}{\varepsilon_0} \Rightarrow Q = E\,4\pi r^2 \varepsilon_0$$

$$V_{ba} = -\int_b^a \frac{EQ}{r^2}\,dr = -KQ\left(\frac{-1}{r}\right)\Big|_b^a = KQ\left[\frac{1}{a} - \frac{1}{b}\right]$$

$$C = \frac{Q}{KQ\left[\frac{1}{a}-\frac{1}{b}\right]} \cdot \frac{ab}{ab} = \boxed{C = \frac{4\pi\varepsilon_0\, ab}{b-a}}$$

Cilíndrico



$$\oint \vec{E}\cdot d\vec{S} = \frac{Q}{\varepsilon_0} \rightarrow E = \frac{Q}{2\pi r h \varepsilon_0} = \frac{\lambda}{2\pi r \varepsilon_0} \Rightarrow \boxed{E = \frac{\lambda}{2\pi r \varepsilon_0}}$$

$$V_{ba} = -\int_b^a \frac{\lambda}{2\pi\varepsilon_0 r}\,dr \Rightarrow \boxed{V_{ba} = \frac{\lambda}{2\pi\varepsilon_0}\ln\left(\frac{b}{a}\right)}$$

$$\boxed{C = \frac{2\pi\varepsilon_0 h}{\ln\left(\frac{b}{a}\right)}}$$

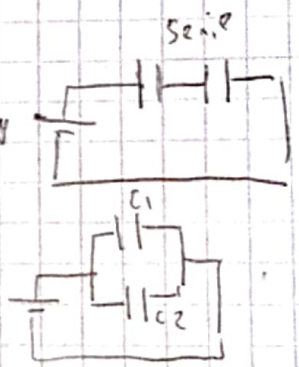
Plano

$$\vec{E} = \frac{\sigma}{\varepsilon_0}(-\hat{x}) \Rightarrow V(x) = -\int \vec{E}\cdot d\vec{x} = -\int_0^x \frac{\sigma}{\varepsilon_0}\,dx \Rightarrow \boxed{V(x) = \frac{\sigma x}{\varepsilon_0}}$$

$$\boxed{V = E\cdot d}$$

$$\boxed{C = \varepsilon_0 \cdot \frac{A}{d}}$$

Energía: $\boxed{U = \frac{1}{2}\frac{Q^2}{C} = \frac{1}{2}VQ = \frac{1}{2}C\cdot V^2}$



$V = V_{C1} + V_{C2}$

$C_{eq} = \frac{C_1 C_2}{C_1 + C_2}$

$Q_1 = Q_2$

$C_{eq} = C_1 + C_2$

$V_{C1} = V_{C2} = V$

Dieléctricos

$\boxed{C = K\cdot C_0}$ sin dieléctrico

$\boxed{\varepsilon = \varepsilon_r\cdot\varepsilon_0 = K\cdot\varepsilon_0}$

$\boxed{\oint_{SG} \vec{D}\cdot d\vec{S} = Q_{Encl}}$

Desplazamiento: $\boxed{\vec{D} = \varepsilon\cdot\vec{E}}$

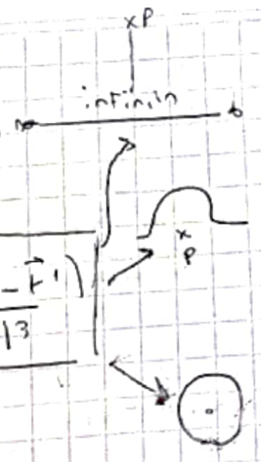
$$\boxed{E = E_{Libre} - E_{Polarizacion} = \frac{\sigma_l}{\varepsilon_0} - \frac{\sigma_p}{\varepsilon_0}}$$

$$\boxed{\sigma_p(R) = \varepsilon_0\,(\varepsilon_r - 1)\,E(R)}$$

Signos opuestos a cierto R

MAGNETISMO

$$\vec{F}_{mg} = q.\vec{v} \times \vec{B} = \int I\,\vec{dl} \times \vec{B}$$ sen (α)



$$B_P = \frac{\mu_0 . I}{2\pi . r_P}$$

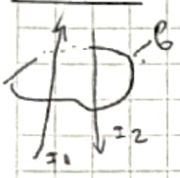
$$B_P = \frac{\mu_0 \, I}{4R}$$

$$B_P = \frac{\mu_0 . I}{2r}$$

Biot Savart (en un punto)

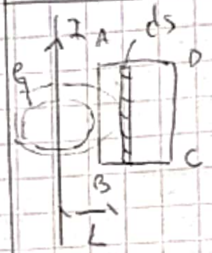
$$dB = \frac{\mu_0}{4\pi} . \frac{i\,\vec{dl} \times \vec{r}_P}{|r_P|^2} = \frac{\mu_0}{4\pi} \frac{i\,\vec{dl} \times (\vec{r} - \vec{r}')}{|\vec{r} - \vec{r}'|^3}$$

Ampere



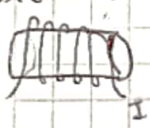
$$\oint_C \vec{B} . \vec{dl} = \mu_0 . I_C$$ ← dela curva C

$+I_1 \quad -I_2$



$$\phi_{mg} = \int_{r_B}^{r_C} \vec{B} . \vec{ds} = \frac{\mu_0 I}{2\pi r} . \overline{CD} . dr$$

Solenoide



$$B = \mu_0 . n . I$$ $n = \frac{N}{l}$: espiras

Toroide

$$B = \frac{\mu_0 . N . I}{2\pi . r}$$

FARADAY - Flujo

variacion circuito — variacion campo

$$\phi_{mg} = N \int_S \vec{B} . \vec{dS}$$

$$\mathcal{E} = \oint_C \vec{E}' . \vec{dl} = -\frac{d\phi}{dt} = \oint_C \vec{v} \times \vec{B} . \vec{dl} - \int \frac{d\vec{B}(t)}{dt} . \vec{dS}$$

$$\mathcal{E} = R . I$$

$$i = \frac{dq(t)}{dt}$$

$$B . ds = B . dx . L \Rightarrow |\mathcal{E}| = \frac{d\phi}{dt} = \frac{B\, dx\, L}{dt} \Rightarrow |\mathcal{E}| = B . v . L$$

$$B . ds . \hat{n} \Rightarrow B . d\theta . \frac{R^2}{2} \Rightarrow |\mathcal{E}| = B . \frac{d\theta}{dt} . \frac{R^2}{2} \Rightarrow |\mathcal{E}| = B . w . \frac{R^2}{2}$$

($ds = d\theta . \frac{R^2}{2}$, $\frac{d\theta}{dt} = w$)

Autoinduccion - Induccion mutua

$$L = \frac{\phi_{mg}\ total}{I}$$ inductancia

Inductancia Mutua

$$M_{12} = \frac{\phi_{12}}{I_2} \qquad M_{21} = \frac{\phi_{21}}{I_1}$$

Solenoide: $L = \mu_0 . n^2 . S . l$

$$\phi_{total\ Solenoide} = \mu_0 . n^2 . S . l . I$$

Toroide: $$L = \frac{N^2 \mu_0 . h . \ln\left(\frac{r_b}{r_a}\right)}{2\pi}$$

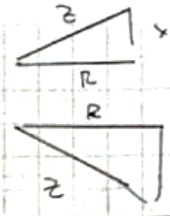
$$\mathcal{E}_1(t) = -L_1 \frac{di_1(t)}{dt} - M_{12} \frac{di_2(t)}{dt}$$

$$\mathcal{E}_2(t) = -M_{21} \frac{di_1(t)}{dt} - L_2 \frac{di_2(t)}{dt}$$

NOTA

Scanned with CamScanner

ALTERNA

- CIVIL 

$$\underset{\text{Impedancia}}{Z} = \sqrt{R^2 + \underbrace{(X_L - X_C)^2}_{\text{Reactancia}}} = \frac{V_g}{I} = \frac{\hat{V_g}}{\hat{I}}$$

$$\hat{V_g} = V_g \cdot \sqrt{2} \quad \wedge \quad \hat{I} = I \cdot \sqrt{2}$$

$$V_g^2 = V_R^2 + (V_L - V_C)^2$$

$$X_L \cdot I_{ef} = V_L$$

$$X_C \cdot I_{ef} = V_C$$

$$\omega = 2\pi \cdot F \qquad X_L = \omega \cdot L \qquad X_C = \frac{1}{\omega C}$$

$$\varphi = \text{Arctg}\left(\frac{X_L - X_C}{R}\right) = \text{Arctg}\left(\frac{V_L - V_C}{R}\right) = \text{Arctg}\left(\frac{\omega L}{R}\right)$$

$$FP = \frac{P}{S} = \cos(\varphi) = \frac{R}{Z}$$ Factor Potencia

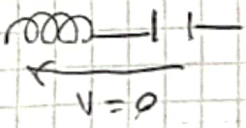
$$S = Z \cdot I \cdot I = V_g \cdot I = \frac{\hat{V_g} \cdot \hat{I}}{2}$$ Potencia Aparente

$$P = S \cdot \cos(\varphi) = I_{ef}^2 \cdot R$$ Potencia Activa o media

$$Q = S \cdot \sin(\varphi)$$ Potencia Reactiva

$$V_g(t) = \hat{V_g} \cdot \sin(\omega t + \varphi)$$

Resonancia:

- $X_L = X_C$ | $V_C = V_L$
- $f_0 = \frac{1}{2\pi\sqrt{LC}}$ (Freq Resonancia)
- 

- $Z = R$
- $\omega_0 = \frac{1}{\sqrt{LC}}$
- $\varphi = 0 \quad \wedge \quad \cos(\varphi) = 1$