Capacitance (H.1)

20160704

Based on
Engineering Electromagnetics
Hayt & Buck

$$\mathbf{D} = \varepsilon_0 \mathbf{E} + \mathbf{P}$$

$$\nabla \cdot \mathbf{D} = \rho_v$$

$$\mathbf{P} = \chi_e \varepsilon_0 \mathbf{E}$$

$$\varepsilon = \varepsilon_0 \varepsilon_r$$

$$\mathbf{D} = \varepsilon \mathbf{E}$$

$$\nabla \cdot \mathbf{D} = \rho_v$$

$$\oint_S \mathbf{D} \cdot d\mathbf{S} = Q$$

$$E_{tan1} = E_{tan2}$$

$$D_{N1} - D_{N2} = \rho_S$$

$$D_{N1} = D_{N2}$$

$$D_t = E_t = 0$$

$$D_N = \varepsilon E_N = \rho_S$$

$$C = \frac{Q}{V_0}$$

$$C = \frac{Q}{V_0} = \frac{\varepsilon S}{d}$$

$$W_E = \frac{1}{2} C V_0^2 = \frac{1}{2} Q V_0 = \frac{1}{2} \frac{Q^2}{C}$$

$$C = \frac{2\pi\varepsilon L}{\ln(b/a)}$$

$$C = \frac{Q}{V_{ab}} = \frac{4\pi\varepsilon}{\frac{1}{a} - \frac{1}{b}}$$

$$C = 4\pi\varepsilon a$$

$$\frac{\Delta L_t}{\Delta L_N} = \text{const} = \frac{1}{\varepsilon} \frac{\Delta \varphi}{\Delta V}$$

$$C = \frac{N_Q}{N_V} \varepsilon \frac{\Delta L_t}{\Delta L_N} = \varepsilon \frac{N_Q}{N_V}$$

$$RC = \frac{\varepsilon}{\sigma}$$