

FFY600: Formel samling

Kapitel 23

$$F_{12} = k_e \frac{q_1 q_2}{r^2}$$

$$k_e = 8.89 \times 10^9 \text{ Nm}^2 / \text{C}^2$$

$$|e| = 1.602 \times 10^{-19} \text{ C}$$

$$E = \frac{F_e}{q_0}$$

$$E = k_e \frac{q}{r^2}$$

$$E = k_e \sum_i \frac{q_i}{r_i^2}$$

$$E = k_e \frac{dq}{r^2}$$

$$a = \frac{q E}{m}$$

Kapitel 24

$$F_E = EA \cos \theta$$

$$F_E = \oint_{\text{surface}} E \cdot dA$$

$$F_E = \oint_{\text{surface}} E \cdot dA = \frac{q_{\text{in}}}{\epsilon_0}$$

$$E = \frac{S}{2\epsilon_0}$$

Kapitel 25

$$DU = -q_0 \int_a^b E \cdot ds$$

$$DV = \frac{DU}{q_0} = - \int_a^b E \cdot ds$$

$$DV = -E \cdot d$$

$$V = k_e \frac{q}{r}$$

$$U = k_e \frac{q_1 q_2}{r_{12}}$$

$$E_x = - \frac{dV}{dx}$$

Kapitel 26

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

$$C_{eq} = C_1 + C_2 + C_3 + \dots$$

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$$

$$U = \frac{Q^2}{2C} = \frac{1}{2} Q DV = \frac{1}{2} C (DV)^2$$

$$C = \epsilon_0 \frac{A}{d}$$

$$E = \frac{S}{\epsilon_0}$$

$$u_E = \frac{1}{2} \epsilon_0 E^2$$

$$C = k C_0$$

$$\epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2 / \text{Nm}^2$$

Kapitel 27

$$I = \frac{dQ}{dt}$$

$$I_{av} = nqv_d A$$

$$J = \frac{I}{A} = nqv_d$$

$$\vec{J} = s \vec{E}$$

$$r = \frac{1}{s}$$

$$R = \frac{l}{sA} = \frac{DV}{I}$$

$$v_d = \frac{qE}{m} t$$

$$r = \frac{m_e}{nq^2 t}$$

$$r = r_0 [1 + \alpha(T - T_0)]$$

$$P = IDV = \frac{(DV)^2}{R}$$

Kapitel 28

$$R_{eq} = R_1 + R_2 + R_3 + R_4 + \dots$$

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} + \dots$$

$$\hat{A} I_{in} = \hat{A} I_{out}$$

$$\hat{A} DV = 0$$

closed loop

$$q(t) = Q(1 - e^{-t/RC})$$

$$I(t) = \frac{e}{R} e^{-t/RC}$$

$$Q = Ce$$

Kapitel 29

$$\vec{F}_B = q \vec{v} \times \vec{B}$$

$$F_B = |q|vB \sin \theta$$

$$\vec{F}_B = I \vec{L} \times \vec{B}$$

$$d\vec{F}_B = I d\vec{s} \times \vec{B}$$

$$\vec{m} = I \vec{A}$$

$$\vec{\tau} = \vec{m} \times \vec{B}$$

$$r = \frac{mv}{qB}$$

$$w = \frac{qB}{m}$$

Kapitel 30

$$dB = \frac{\mu_0}{4\pi} \frac{I d\vec{s} \times \vec{r}}{r^2}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ Tm / A}$$

$$B = \frac{\mu_0 I}{2\pi a}$$

$$\frac{F_B}{l} = \frac{\mu_0 I_1 I_2}{2\pi a}$$

$$\oint \vec{B} \cdot d\vec{s} = \mu_0 I$$

$$B = \frac{\mu_0 NI}{2\pi r} \quad (\text{toroid})$$

$$B = \frac{\mu_0 NI}{l} = \mu_0 nI \quad (\text{solenoid})$$

$$\vec{F}_B = \oint \vec{B} \times d\vec{A}$$

$$\oint \vec{B} \cdot d\vec{s} = \mu_0 I + \epsilon_0 \mu_0 \frac{dF_E}{dt}$$

Kapitel 31

$$e = - \frac{d\Phi_B}{dt}$$

$$\Phi_B = \int_S \vec{B} \cdot d\vec{A}$$

$$e = - Blv$$

$$e = \int_S \vec{E} \cdot d\vec{s} = - \frac{d\Phi_B}{dt}$$

$$\int_S \vec{E} \cdot d\vec{A} = \frac{Q}{\epsilon_0}$$

$$\int_S \vec{B} \cdot d\vec{A} = 0$$

$$\int_S \vec{E} \cdot d\vec{s} = - \frac{d\Phi_B}{dt}$$

$$\int_S \vec{B} \cdot d\vec{s} = \mu_0 I + \epsilon_0 \mu_0 \frac{d\Phi_E}{dt}$$

Kapitel 32

$$e_L = - L \frac{dI}{dt}$$

$$L = \frac{N\Phi_B}{I}$$

$$L = \mu_0 \frac{N^2 A}{l}$$

$$I = \frac{e}{R} (1 - e^{-t/\tau}); \tau = L/R$$

$$I = \frac{e}{R} e^{-t/\tau}$$

$$U = \frac{1}{2} LI^2$$

$$u_B = \frac{B^2}{2\mu_0}$$

$$M_{12} = \frac{N_2 \Phi_{12}}{I_1} = M_{21} = \frac{N_1 \Phi_{21}}{I_2} = M$$

$$e_2 = M_{12} \frac{dI_1}{dt} \text{ and } e_1 = M_{21} \frac{dI_2}{dt}$$

$$Q = Q_{\max} \cos(\omega t + \phi)$$

$$I = \frac{dQ}{dt} = -\omega Q_{\max} \sin(\omega t + \phi)$$

$$\omega = \frac{1}{\sqrt{LC}}$$

$$U = U_C + U_L = \frac{Q_{\max}^2}{2C} \cos^2 \omega t + \frac{LI_{\max}^2}{2} \sin^2 \omega t$$

Kapitel 33

$$I_{rms} = 0.707 I_{\max}$$

$$DV_{rms} = 0.707 DV_{\max}$$

$$X_L = \omega L$$

$$X_C = \frac{1}{\omega C}$$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$\phi = \tan^{-1} \left(\frac{X_L - X_C}{R} \right)$$

$$P_{av} = I_{rms} DV_{rms} \cos \phi$$

$$P_{av} = I_{rms}^2 R$$

$$I_{rms} = \frac{DV_{rms}}{\sqrt{R^2 + (X_L - X_C)^2}}$$

$$\omega_0 = \frac{1}{\sqrt{LC}}$$

$$I_1 DV_1 = I_2 DV_2$$