

## Formelsammlung

### Feldlehre

2 El. Feldstärke und Spannung

$$F = (1 / 4\pi\epsilon_0\epsilon_r) * (Q_1Q_2 / r^2) * r_0$$

$$F = Q_{LT} E \Rightarrow E = F / Q_{LT}$$

$$W_{LT} = -Q_{LT} E l_{12}$$

$$\varphi_P = W_{LT}(P) / Q_{LT}$$

$$\varphi_P = -E * l_{BP}$$

$$U_{12} = \varphi_1 - \varphi_2$$

$$U_{12} = E l_{12}$$

$$\int E ds = 0 \text{ (Umlaufintegral)}$$

Die el. Stromdichte

$$J = E * Kappa$$

$$I = J A \cos \alpha$$

$$I = \int_A J dA$$

$$p = dp / dV = E J = Kappa * E^2 = J^2 / Kappa$$

$$R = \ln(r_o / r_i) / Kappa 2 \pi h \text{ (R Hohlzylinder)}$$

3 Dielektrisches Feldstärke

$$Q = \epsilon (U A / d)$$

$$\epsilon = \epsilon_0 \epsilon_r$$

$$D = \epsilon E$$

$$Q = \int D dA \text{ (Hüllenintegral)}$$

$$\Psi = \int D dA$$

$$D = dQ / dA$$

$$C = \epsilon (A / d)$$

$$Q = C U$$

$$U = \int E ds \Leftrightarrow E = dU / ds$$

$$i = C (du / dt)$$

$$U_i / U = (1 / C_i) / (1 / C_e) = C_e / C_i$$

$$U_w = U - \sum U_a$$

$$Q_v = U_w C_e \text{ (Verschiebeladung)}$$

Kondensatorspannungen bei Reihenschaltung vorgeladener Kondensatoren:

$$U_i = (Q_{ia} + Q_v) / C_i = U_{ia} + (C_e / C_i) U_w$$

$$u = U_0 e^{-t/\tau}$$

$$\tau = RC$$

$$i = (U_0 / R) e^{-t/\tau}$$

### Gleichstromlehre

2 El Ladung und ihr Feld

$$I = \Delta Q / \Delta t$$

$$I = Q_{LT} n A r = Q_{LT} n A b E$$

$$Kappa = Q_{LT} n b$$

$$I = Kappa A E$$

$$\delta = 1 / Kappa = 1 / (Q_{LT} n b)$$

$$\varphi(x) = W_{LT}(x) / Q_{LT}$$

$$U_{12} = (W_1 - W_2) / Q_{LT} = \varphi_1 - \varphi_2$$

$$G = Kappa A / l$$

$$R = 1 / G = (1 / Kappa) * (1 / A) = \rho (1 / A)$$

$$I = G U \Leftrightarrow U = R I$$

$$U_{12} = \varphi_1 - \varphi_2 = E l_{12}$$

$$R(\theta) = R_{20} (1 + \alpha_{20} \Delta\theta)$$

$$R(\theta) = R_{20} (1 + \alpha_{20} \Delta\theta + \beta_{20} \Delta\theta^2)$$

$$P = U I \Leftrightarrow P = G U^2 \Leftrightarrow P = R I^2$$

3 Der el. Stromkreis

$$R_{stat} = U_0 / I_0$$

$$R_{diff} = \Delta U / \Delta I$$

Spannungsteilerregel

$$U_i / U_k = R_i / R_k$$

$$U_i / U = R_i / R_e$$

Stromteilerregel

$$I_i / I_k = G_i / G_k$$

$$I_i / I = G_i / G_e$$

Spannungsteilerverhältnisse

$$\alpha = U_a / U_e = R_2 / (R_1 + R_2)$$

$$\alpha = R_2 R_a / (R_1 R_2 + R_2 R_a + R_1 R_a)$$

Stromteilerverhältnisse

$$\beta = I_a / I_e = G_2 / (G_1 + G_2) = R_1 / (R_1 + R_2)$$

$$\beta = G_2 G_a / (G_1 G_a + G_1 G_2 + G_1 G_a) =$$

$$= R_1 / (R_1 + R_2 + R_3)$$