Formuleblad HBO Elektrotechniek - Energietechniek

Elektrische Netwerken (Paul Holmes)

Hoofdstuk 1 : §1.8	$U = I \cdot R$	Kirchhoff Maas $\sum_{j=1}^{N} U_j = 0$	Kirchhoff Knoop $\sum_{j=1}^{N} I_j = 0$	
Hoofdstuk 2 : §2.5	Serieschakeling $R_v = \sum_{i=1}^{n} R_i$	Parallelschakeling $R_v = \frac{1}{\sum_{i=1}^{n} \frac{1}{R_i}}$	U deling $U_1 = \frac{R_1}{R_1 + R_2} \cdot U$	
Hoofdstuk 3 : §3.10	Thévenin : $I_k = \frac{U_o}{R_i}$	Norton : $U_o = I_k \cdot R_i$		
Hoofdstuk 4 : §4.3	Vermogen $P = U \cdot I = I^2 \cdot R = \frac{U^2}{R}$	Energie $W = U \cdot I \cdot t$	Rendement $\eta = \frac{P_{nuttig}}{P_{totaal}}$	
Hoofdstuk 5 : §5.8	$U_{eff} = \sqrt{\frac{u^2{}_1 + u^2{}_2 + \ldots + u^2{}_n}{n}}$	$U_{eff\,blok} = \hat{u}$	$U_{eff\,sinus} = \frac{\hat{u}}{\sqrt{2}}$	$U_{eff\,zaag} = \frac{\hat{u}}{\sqrt{3}}$
Hoofdstuk 6 : §6.7	Serieschakeling $C_v = \frac{1}{\sum_{i=1}^{n} \frac{1}{C_i}}$ $L_v = \sum_{i=1}^{n} L_i$	Parallelschakeling $C_v = \sum_{i=1}^{n} C_i$ $L_v = \frac{1}{\sum_{i=1}^{n} \frac{1}{L_i}}$	Definitieformule $i_C = C \frac{du_C}{dt}$ $u_L = L \frac{di_L}{dt}$	Harmonische reactantie $X_C = \frac{1}{\omega C}\ [\Omega]$ $X_L = \omega L\ [\Omega]$
Hoofdstuk 7 : §7.7	$I_R = sin\omega t \rightarrow U_R = R \cdot sin\omega t$	$U_C = sin\omega t \rightarrow I_C = X_C \cdot cos\omega t$	$I_L = sin\omega t \rightarrow U_L = X_L \cdot cos\omega t$	
Hoofdstuk 9 : §9.6	Harmonische spanning: $u(t) = \hat{u} cos(\omega t + \phi) \Longleftrightarrow \underline{U} = \hat{u} \cdot e^{j\phi}$ $\underline{U} = \hat{u} \cdot e^{j\phi} = [Re(\underline{U})] + j \cdot [Im(\underline{U})]$ $\underline{U_*} = \hat{u} \cdot e^{-j\phi} = [Re(\underline{U})] - j \cdot [Im(\underline{U})]$		Modulus en argument: $\hat{u} = \lvert \underline{U} \rvert = \sqrt{Re^2 + Im^2}$ $\phi = \angle \underline{U} = tan^{-1} \frac{Im}{Re}$	Complexe impedantie: $Z_R = R$ $Z_C = \frac{1}{j\omega C}$ $Z_L = j\omega L$

Hoofdstuk 10: §10.5	Standaard complex getal: z = a + bj , j^2 = -1 $z_* = a - bj$	Polair complex getal: $z = \lvert z \rvert \angle z$ Regel van Euler: $e^{j\phi} = cos\phi + j\ sin\phi$	$z_1 + z_2 = (a_1 + a_2) + (b_1 + b_2)j$ $z_1 \cdot z_2 = (a_1a_2 - b_1b_2) + (a_1b_2 + a_2b_1)j$ $\frac{z_1}{z_2} = \frac{z_1 \cdot z_{2*}}{\lvert z_2 \rvert}$	Omzetting: $\lvert z \rvert = \sqrt{a^2 + b^2}$ $\angle z = tan^{-1}\frac{b}{a}$
Hoofdstuk 11: §11.6	Momentaan vermogen: $p(t) = U \cdot I(cos\phi - cos(2\omega t + \phi))$	Werkzaam vermogen: $P = U \cdot I\, cos\phi\ [W]$ Blindvermogen: $Q = U \cdot I\, sin\phi\ [VAR]$	Schijnbaar vermogen: $S = U \cdot I = u_{eff} \cdot i_{eff}\ [VA]$ Driehoek: $S^2 = P^2 + Q^2$	Complex vermogen: $\underline{U} = U$ $\underline{I} = I \cdot e^{j\phi}$ $\underline{S} = \underline{U} \cdot \underline{I_*}$ $\underline{P} = Re[\underline{U} \cdot \underline{I_*}]$ $\underline{Q} = Im[\underline{U} \cdot \underline{I_*}]\, j$
Hoofdstuk 20: §20.6	Ster⇔Driehoek: van Δ naar Y $Z_1 = \frac{Z_{12}Z_{31}}{Z_{12} + Z_{23} + Z_{31}}$ $Z_2 = \frac{Z_{12}Z_{23}}{Z_{12} + Z_{23} + Z_{31}}$ $Z_3 = \frac{Z_{23}Z_{31}}{Z_{12} + Z_{23} + Z_{31}}$	Ster⇔Driehoek: van Y naar Δ $Y_{12} = \frac{Y_1Y_2}{Y_1 + Y_2 + Y_3}$ $Y_{23} = \frac{Y_2Y_3}{Y_1 + Y_2 + Y_3}$ $Y_{13} = \frac{Y_1Y_3}{Y_1 + Y_2 + Y_3}$	Alle zijden gelijk: $Z_\Delta = 3Z_Y$ en $Z_Y = \frac{Z_\Delta}{3}$	
Hoofdstuk 21: §21.4	Koppeling L_1 en L_2: $M = k\sqrt{L_1 \cdot L_2}$	Spreiding: $\sigma = 1 - k^2$	Transformator: $n = \frac{u_1}{u_2} = \frac{-i_1}{i_2}$ $n^2 = \frac{Z_1}{Z_2}$	
Wiskunde	$ax^2 + bx + c = 0$ ➠ $D = b^2 - 4ac$	D ≥ 0 : $x_{1,2} = \frac{-b \pm \sqrt{D}}{2a}$	D < 0 : $x_{1,2} = \frac{-b \pm j\sqrt{-D}}{2a}$	
Wiskunde	$cos\alpha = sin(\frac{\pi}{2} - \alpha)$ $sin2\alpha = 2sin\alpha\, cos\alpha$	$cos^2\alpha + sin^2\alpha = 1$	$cos^2\alpha = \frac{1}{2} + \frac{1}{2}cos2\alpha$ $sin^2\alpha = \frac{1}{2} - \frac{1}{2}cos2\alpha$	
Wiskunde	$\frac{d}{dt}cos(\omega t + \phi) = -\omega sin\omega t$	$\frac{d}{dt}sin\omega t = \omega cos\omega t$	$\int_{\Omega_1}^{\Omega_2} cos\omega t = \frac{sin\Omega_2}{\Omega_2} - \frac{sin\Omega_1}{\Omega_1}$	$\int \frac{1}{x}dx = ln x + K$

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