DC-LC

$$\omega = \frac{1}{\sqrt{LC}} = 2\cdot\pi\cdot f = \frac{2\cdot\pi}{T}$$

$$t_V = T/2 = \pi\sqrt{LC}$$

$$i_M = \frac{E_B}{\sqrt{\frac{L}{C}}}$$

D–R

$$U_{\mathrm{d}} = \frac{1}{2\pi}\int_0^{\pi} U_s \sin(\omega t) d(\omega t) = \frac{U_{\mathrm{s}}}{\pi}$$

$$I_{\mathrm{d}} = \frac{U_{\mathrm{d}}}{R_{\mathrm{d}}} = \frac{U_{\mathrm{s}}}{\pi\cdot R_{\mathrm{d}}}$$

$$P = I_{\mathrm{d,rms}}^2 R_{\mathrm{d}} = \frac{U_{\mathrm{d,rms}}^2}{R_{\mathrm{d}}}$$

$$U_{\mathrm{d,rms}} = \sqrt{\frac{1}{2\pi}\int_0^{\pi} U_s^2 \sin^2(\omega t) d(\omega t)} = \frac{U_{\mathrm{s}}}{2}$$

$$I_{\mathrm{d,rms}} = \frac{U_{\mathrm{d,rms}}}{R_d} = \frac{U_{\mathrm{s}}}{2R_{\mathrm{d}}}$$

D-L

$$I_{DM} = \frac{1}{L}\int_0^{T/2} u(t) dt = \frac{1}{\omega L}\int_0^{\pi} U_M \sin\omega t\, d(\omega t)$$

$$I_{DM} = \frac{2U_M}{\omega L}$$

D–RE

$$\alpha = \arcsin\frac{E_B}{u}$$

$$\gamma = 180 - 2\alpha$$

$$I_{D(AV)} = \frac{1}{T}\int_0^{T}\frac{u_R(t)}{R} dt = \frac{1}{2\pi R}\int_{\alpha}^{\pi-\alpha}\left[u(\omega t) - E_B\right] d(\omega t)$$

$$I_{D(EF)} = \sqrt{\frac{1}{T}\int_0^{T}\left(\frac{u_R(t)}{R}\right)^2 dt}$$

$$P = P_R + P_B$$

$$P = I_{D(EF)}^2\cdot R + E_B\cdot I_{D(AV)}$$

D–RL

$$i(t) = \frac{U_{\mathrm{s}}}{Z}\left[\sin(\omega t - \varphi) + \sin(\varphi) e^{-\frac{\omega t}{\omega\tau}}\right]$$

D–R||C

$$I_{D,\max} = \omega\cdot C\cdot U_s\cos(\alpha) + \frac{U_s\sin(\alpha)}{R_d} =$$

$$= U_s\left[\omega\cdot C\cdot\cos(\alpha) + \frac{\sin(\alpha)}{R_d}\right]$$

$$\Delta U_d \approx U_s\frac{2\pi}{\omega\cdot R_d\cdot C} = \frac{U_{\mathrm{s}}}{f\cdot R_d\cdot C}$$

D–RLE–PD

$$U_d = \frac{U_s}{\pi}$$

$$I_d = \frac{U_d}{R_d} = \frac{U_s}{\pi\cdot R_d}$$

$$P_d = I_s^2 R_d$$

$$I_{s,rms} = \sqrt{\frac{1}{2\pi}\int_0^{\pi} I_s^2 d(\omega t)}$$

$$\lambda = \frac{P}{S} = \frac{P}{U_{s,rms} I_{s,rms}}$$

$$I_{\mathrm{D}} = \frac{I_{\mathrm{d}}}{2}$$

T–R

$$U_d = \frac{1}{2\pi}\int_{\alpha}^{\pi} U_s \sin(\omega t) d(\omega t) = \frac{U_s}{2\pi}\left[1 + \cos(\alpha)\right]$$

$$U_{d,rms} = \sqrt{\frac{1}{2\pi}\int_{\alpha}^{\pi}\left[U_s\sin(\omega t)\right]^2 d(\omega t)} =$$

$$= \frac{U_s}{2}\sqrt{1 - \frac{\alpha}{\pi} + \frac{\sin(2\alpha)}{2\pi}}$$

T–L

$$Z = \sqrt{R^2 + (\omega L)^2}$$

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

$$\omega\tau = \omega L / R$$

$$i_d = \frac{\sqrt{2}V_S}{Z}\sin(\omega t - \phi) + \frac{\sqrt{2}V_S}{Z}\sin(\phi) e^{-\frac{\omega t}{\omega\tau}}, \alpha = 0$$

$$i_d = \frac{\sqrt{2}V_S}{Z}\sin(\omega t - \phi) - \frac{\sqrt{2}V_S}{Z} e^{\frac{\alpha}{\omega\tau}}\sin(\alpha - \phi) e^{-\frac{\omega t}{\omega\tau}}, \alpha \neq 0$$

$$I_{AV} = \frac{1}{2\pi}\int_{\alpha}^{\beta} i_d(\omega t)\, d(\omega t)$$

$$I_{rms} = \sqrt{\frac{1}{2\pi}\int_{\alpha}^{\beta}\left[i_d(\omega t)\right]^2 d(\omega t)}$$

$$P = I_{rms} R$$

$$PF = \frac{P}{S} = \frac{P}{U_{rms} I_{rms}}$$

T-RLE

$$\alpha_{\min} = \sin^{-1}\left(\frac{E_d}{U_s}\right)$$

$$i(\omega t) = \frac{U_s}{2}\sin(\omega t - \theta) - \frac{E_d}{R_d} + A e^{-\frac{\omega t}{\omega\tau}}$$

$$A = \left[-\frac{U_s}{2}\sin(\omega t - \alpha) - \frac{E_d}{R_d}\right] e^{\frac{\alpha}{\omega t}}$$

1DFM-R

$$U_d = \frac{1}{\pi}\int_0^{\pi} U_s \sin(\omega t) d(\omega t) = \frac{2U_s}{\pi}$$

$$I_d = \frac{U_d}{R_d} = \frac{2U_s}{\pi\cdot R_d}$$

$$I_{d,rms} = I_{s,rms} = \frac{I_s}{\sqrt{2}}$$

1DFM-L

$$u_d(\omega t) = U_d + \sum_{n=2,4\ldots}^{\infty} U_n\cos(n\omega t + \pi)$$

$$U_n = \left(\frac{2U_s}{\pi}\right)\left(\frac{1}{n-1} - \frac{1}{n+1}\right)$$

$$U_d = \frac{2U_s}{\pi}$$

$$I_d = \frac{U_d}{R_d}$$

$$I_n = \frac{U_n}{Z_n} = \frac{U_n}{\left|R_d + jn\omega L_d\right|}$$

1DFM-RLE

$$I_d = \frac{U_d - E_d}{R_d} = \frac{\frac{2U_s}{\pi} - E_d}{R_d}$$

1DFM-komutacija

$$U_d = \frac{2U_s}{\pi} - 2f\,\frac{2X_k I_d}{\omega}$$

$$U_d = \frac{2U_s}{\pi}\left(1 - \frac{\pi}{2U_s}\cdot 2\cdot\frac{\omega}{2\pi}\cdot\frac{2X_k I_d}{\omega}\right) =$$

$$= \frac{2U_s}{\pi}\left(1 - \frac{X_k I_d}{U_s}\right)$$

$$U_{d0} = \frac{2U_s}{\pi}$$

$$R_e = \frac{\dfrac{2U_s}{\pi}}{\dfrac{U_s}{X_k}} = \frac{2X_k}{\pi}$$

$$u = \arccos\left(1 - \frac{2X_k I_d}{U_s}\right)$$

$$U_d = U_{d0}\left(1 - \frac{X_k I_d}{U_s}\right) = \frac{2U_s}{\pi}\left(1 - \frac{X_k I_d}{U_s}\right) =$$

$$= \frac{U_s}{\pi}(1 + \cos u)$$

1DFM-PD-kom

$$2X_k = X_k'$$

$$u = \arccos\left(1 - \frac{\omega L_k I_d}{U_s}\right) = \arccos\left(1 - \frac{X_k I_d}{U_s}\right)$$

$$U_d = \frac{U_s}{2\pi}\int_u^{\pi}\sin(\omega t)\,d(\omega t) = \frac{U_s}{\pi}\left(1 - \frac{X_k I_d}{2U_s}\right) = \frac{U_s}{2\pi}(1 + \cos u)$$

3DFM-kom

$$U_d = \frac{3\sqrt{3}U_s}{2\pi}\left(1 - \frac{2\pi}{3\sqrt{3}}\cdot\frac{1}{U_s}\cdot 3\cdot\frac{\omega}{2\pi}\cdot\frac{1}{\omega}\cdot X_k I_d\right) =$$

$$= \frac{3\sqrt{3}U_s}{2\pi}\left(1 - \frac{X_k I_d}{\sqrt{3}\cdot U_s}\right)$$

1FM-R

$$U_{d\,avg} = U_d = \frac{1}{\pi}\int_{\alpha}^{\pi} U_S \sin(\omega t)\,d(\omega t)$$
$$= \frac{U_{d0}}{2}\,(1 + \cos(\alpha))$$

$$I_d = \frac{U_d}{R_d} = \frac{U_s}{\pi\cdot R_d}(1 + \cos\alpha)$$

$$I_{T1\,avg} = \frac{I_d}{2}$$

$$I_{T1\,rms} = \frac{I_d}{\sqrt{2}}$$

$$I_{S\,rms} = \frac{U_{S\,rms}}{R_d}\sqrt{1 - \frac{\alpha}{\pi} + \frac{\sin(2\alpha)}{2\pi}}$$

1FM-L

$$U_{d\alpha} = \frac{1}{\pi}\int_{\alpha}^{\pi+\alpha} U_S \sin(\omega t)\,d(\omega t) = \frac{2U_S}{\pi}\cos\alpha = U_{d0}\cos\alpha$$

$$I_d = \frac{U_d}{R_d} = \frac{2U_s}{\pi\cdot R_d}\cos\alpha$$

1FM-RE

$$\beta = \arcsin\frac{E}{U}$$

$$U_{dAV} = \frac{1}{\pi}\int_{\alpha}^{\pi-\beta}(U_S\sin(\omega t) - E)\,d(\omega t)$$

$$I_d = \frac{U_{dAV}}{R_d}$$

1FM-RLE

alfa<90 ispr

alfa>90 izmj

$$U_{d\,avg} = U_d = \frac{1}{\pi}\int_{\alpha}^{\alpha+\pi} U_S \sin(\omega t)\,d(\omega t)$$
$$= \frac{2U_S}{\pi}\cos(\alpha) = U_{d0}\cos(\alpha)$$

$$I_d = \frac{U_{d\alpha} - E_1}{R_d}$$

$$I_{T1\,avg} = \frac{I_d}{2}$$

$$I_{T1\,rms} = \frac{I_d}{\sqrt{2}}$$

$$I_{S\,rms} = I_d$$

1FM-RL-PD

$$U_{d\,avg} = U_d = \frac{1}{\pi}\int_{\alpha}^{\pi} U_S \sin(\omega t)\,d(\omega t)$$
$$= \frac{U_S}{\pi}(1 + \cos(\alpha))$$
$$= \frac{U_{d0}}{2}\,(1 + \cos(\alpha))$$

$$I_d = \frac{U_d}{R_d}$$

$$I_{T1\,avg} = I_d\cdot\frac{\pi - \alpha}{2\pi}$$

$$I_{T1\,rms} = I_d\cdot\sqrt{\frac{\pi - \alpha}{2\pi}}$$

$$I_{S\,rms} = I_d\cdot\sqrt{\frac{\pi - \alpha}{\pi}}$$

1FM-kom

$$u = \arccos\left(\cos\alpha - \frac{2X_k I_d}{U_s}\right) - \alpha$$

$$U_{d\alpha} = \frac{2U_s}{\pi}\left(\cos\alpha - \frac{X_k I_d}{U_s}\right)$$

$$\frac{U_{d\alpha}}{U_{di0}} = \frac{X_k I_d}{U_s} - 1$$

$$\gamma = 180^\circ - (\alpha + u)$$

$$\gamma = \pi - \arccos\left(\frac{2X_k I_d}{U_s} - 1\right)$$

PF

$$\lambda = \frac{P}{S} = \sqrt{\left(1 - \frac{\alpha}{\pi}\right) + \frac{1}{2\pi}\sin 2\alpha}$$

$$k_d = \frac{1}{\sqrt{1 + (THD)^2}}$$

$$THD = \sqrt{\frac{\sum_{n\neq 1} I_n^2}{I_1^2}}$$