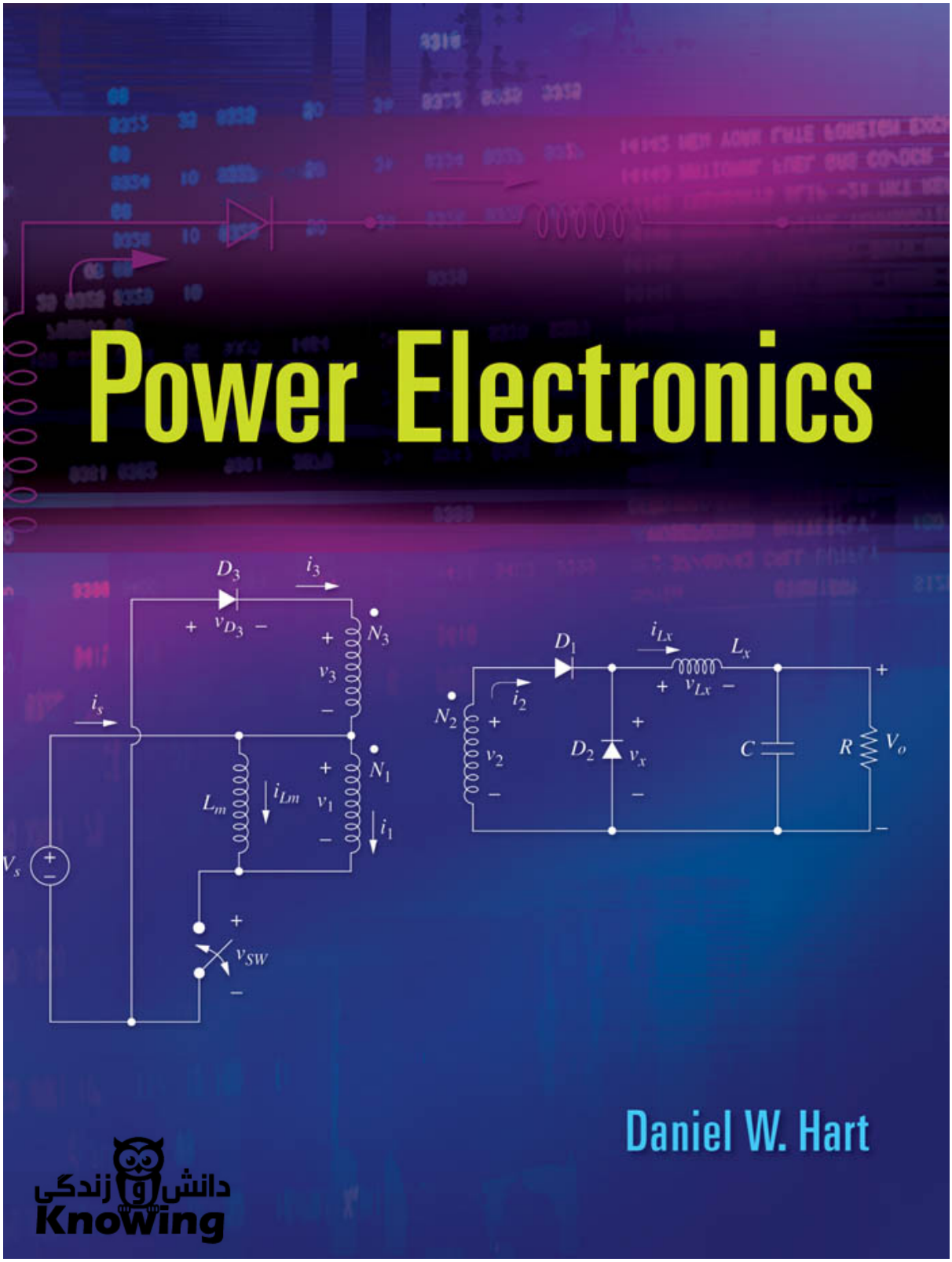

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Commonly used Power and Converter Equations

Instantaneous power: $p(t) = v(t)i(t)$

Energy: $W = \int_{t_1}^{t_2} p(t)\,dt$

Average power: $P = \frac{W}{T} = \frac{1}{T}\int_{t_0}^{t_0+T} p(t)\,dt = \frac{1}{T}\int_{t_0}^{t_0+T} v(t)i(t)\,dt$

Average power for a dc voltage source: $P_{\text{dc}} = V_{\text{dc}} I_{\text{avg}}$

rms voltage: $V_{\text{rms}} = \sqrt{\frac{1}{T}\int_0^T v^2(t)\,dt}$

rms for $v = v_1 + v_2 + \text{v}_3 + \cdots$: $V_{\text{rms}} = \sqrt{V_{1,\text{rms}}^2 + V_{2,\text{rms}}^2 + V_{3,\text{rms}}^2 + \cdots}$

rms current for a triangular wave: $I_{\text{rms}} = \frac{I_m}{\sqrt{3}}$

rms current for an offset triangular wave: $I_{\text{rms}} = \sqrt{\left(\frac{I_m}{\sqrt{3}}\right)^2 + I_{\text{dc}}^2}$

rms voltage for a sine wave or a full-wave rectified sine wave: $V_{\text{rms}} = \frac{V_m}{\sqrt{2}}$

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rms voltage for a half-wave rectified sine wave: $V_{\text{rms}} = \frac{V_m}{2}$

Power factor: $\text{pf} = \frac{P}{S} = \frac{P}{V_{\text{rms}} I_{\text{rms}}}$

Total harmonic distortion: $\text{THD} = \frac{\sqrt{\sum_{n=2}^{\infty} I_n^2}}{I_1}$

Distortion factor: $\text{DF} = \sqrt{\frac{1}{1 + (\text{THD})^2}}$

Form factor $= \frac{I_{\text{rms}}}{I_{\text{avg}}}$

Crest factor $= \frac{I_{\text{peak}}}{I_{\text{rms}}}$

Buck converter: $V_o = V_s D$

Boost converter: $V_o = \frac{V_s}{1 - D}$

Buck-boost and Ćuk converters: $V_o = -V_s \left(\frac{D}{1 - D} \right)$

SEPIC: $V_o = V_s \left(\frac{D}{1 - D} \right)$

Flyback converter: $V_o = V_s \left(\frac{D}{1 - D} \right) \left(\frac{N_2}{N_1} \right)$

Forward converter: $V_o = V_s D \left(\frac{N_2}{N_1} \right)$

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