Physics Formula Sheet

Chapter by chapter, topic by topic. Written by the PadhoNa team for quick revision.

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CHAPTER 31

Semiconductors

Semiconductors and the p-n junction

$$n_e n_h = n_i^2; \qquad \text{n-type: } n_e \gg n_h; \qquad \text{p-type: } n_h \gg n_e$$

CONDUCTIVITY

$$\sigma = e(n_e \mu_e + n_h \mu_h)$$

Diode circuits and rectifiers

RIPPLE FREQUENCY

$$\text{half-wave: } f; \qquad \text{full-wave: } 2f$$

EFFICIENCY

$$\text{half-wave } 40.6\%; \qquad \text{full-wave } 81.2\%$$

ZENER

$$\text{reverse biased beyond breakdown: voltage stays at } V_z$$

Transistors

$$I_E = I_B + I_C, \qquad \alpha = \frac{I_C}{I_E}, \qquad \beta = \frac{I_C}{I_B} = \frac{\alpha}{1-\alpha}$$

CE AMPLIFIER

$$A_v = -\beta \frac{R_L}{R_{\text{in}}}, \qquad A_p = \beta\, A_v$$

Logic gates

$$\text{AND } Y = AB; \qquad \text{OR } Y = A + B; \qquad \text{NOT } Y = \bar{A}; \qquad \text{NAND } \overline{AB}; \qquad \text{NOR } \overline{A + B}$$

XOR

$$Y = A\bar{B} + \bar{A}B$$

DE MORGAN

$$\overline{A + B} = \bar{A}\,\bar{B}, \qquad \overline{AB} = \bar{A} + \bar{B}$$

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