

Chapter 7: Alternating Current

Short • Exam-ready • CBSE 2026–27 syllabus focused

Core formulas

- AC current: $i = I_m \sin \omega t$; RMS current $I_{\text{rms}} = I_m / \sqrt{2}$. Similarly $V_{\text{rms}} = V_m / \sqrt{2}$.
- Inductive reactance: $X_L = \omega L$. Capacitive reactance: $X_C = 1/(\omega C)$.
- LCR impedance: $Z = \sqrt{R^2 + (X_L - X_C)^2}$.
- $I_{\text{rms}} = V_{\text{rms}}/Z$.
- Phase angle: $\tan \phi = (X_L - X_C)/R$; power factor $= \cos \phi = R/Z$.
- Average power: $P = V_{\text{rms}} I_{\text{rms}} \cos \phi$.

Resonance

- At resonance: $X_L = X_C$; $\omega_m = 1/\sqrt{LC}$; $Z = R$; current is maximum; power factor $= 1$.
- Wattless current occurs when average power is zero (ideal purely inductive/capacitive circuit).

Transformer & generator

- Transformer: $V_s/V_p = N_s/N_p$ for an ideal transformer; approximately $V_{\text{pl}_p} = V_{\text{sl}_s}$.
- AC generator: rotating coil changes magnetic flux and produces alternating emf.

Exam focus

- RMS/peak conversion; LCR impedance and resonance; power factor; transformer ratios; phasor relationships.

Revision tip: learn the formula, understand the symbols, then practise 2–3 application questions from NCERT/CBSE-style problems.