Class 12 - Important Formulas

Chapter 7 - Alternating Current

S.No.	Term	Description
1	**Alternating current**	It is current whose magnitude changes with time and direction reverses periodically. $I=I_0 \sin\omega t$ where I_0 is the peak value of a.c. and $\omega=2\pi/T$ is the frequency
2	**Mean value of a.c.**	$I_m=2I_0/\pi = 0.636I_0$
3	**RMS value**	$I_{rms}=I_0/\sqrt{2}$
4	**a.c. through resistor**	Alternating emf is in phase with current
5	**a.c. through inductor**	Emf leads the current by an phase angle $\pi/2$
6	**a.c. through capacitor**	Emf lags behind the current by an phase angle $\pi/2$
7	**Inductive reactance**	Opposition offered by inductor to the flow of current mathematically, $X_L = \omega L = 2\pi f L$
8	**Capacitive reactance**	Opposition offered by capacitor to the flow of current mathematically, $X_C = \frac{1}{\omega C} = \frac{1}{2\pi f C}$
9	**a.c. through series LR circuit**	Emf leads the current by an phase angle ϕ given by $\tan\phi = \frac{\omega L}{R}$ and impedance of circuit is $Z = \sqrt{R^2 + (\omega^2 L^2)}$
10	**a.c. through series CR circuit**	Emf lags behind the current by an phase angle ϕ given by $\tan\phi = \frac{1/\omega C}{R}$ and impedance of circuit is $Z = \sqrt{R^2 + \left(\frac{1}{\omega^2 C^2}\right)}$
11	**a.c. through series LCR circuit**	Emf **leads/lags behind** the current by an phase angle ϕ given by $\tan\phi = \frac{\omega L - 1/\omega C}{R}$ emf leads the current when $\omega L > \frac{1}{\omega C}$ and lags behind when $\omega L < \frac{1}{\omega C}$ and impedance of circuit is $Z = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$
12	**Average power of an a.c. circuit**	$P_{avg} = I_{rms}^2 R = E_{rms} I_{rms} \cos\phi$ Where ϕ is called power factor of the circuit.
13	**Transformer**	It is a device used to change low alternating voltage at high current into high voltage at low current and vice-versa. Primary and secondary voltage for a transformer are related as $V_S = V_P \frac{N_S}{N_P}$ and current through the coils is related as $I_S = I_P \frac{N_P}{N_S}$