Average Value Of AC

Average value of A.C: If we want to find the mean value over half cycle since the direction of current or emf remains unchanged during a half cycle hence the algebraic sum of instantaneous values will not be zero. The arithmetic mean of all the instantaneous values of current or emf over the half cycle is known as average value of A.C.

$\text{Let} i = i_p \sin\omega t \rightarrow (1)$

$\text{The instantaneous value of current at an instant of time } t$

$$i_{ave} = \frac{1}{T/2}\int_0^{T/2} i dt$$

$$\text{Putting equation}(1): i_{ave} = \frac{1}{T/2}\int_0^{T/2} i_p \sin\omega t dt$$

$$i_{ave} = \frac{2i_p}{T}\left[\frac{-\cos\omega t}{\omega}\right]_0^{T/2}$$

$$i_{ave} = -\frac{2}{T}\frac{i_p}{\frac{2\pi}{T}}\left[\cos\frac{2\pi}{T}\frac{T}{2} - \cos 0\right]$$

$$i_{ave} = -\frac{i_p}{\pi}[\cos\pi - \cos 0]$$

$$i_{ave} = \frac{2i_p}{\pi} \rightarrow (2)$$

Similarly

$$e_{ave} = \frac{2e_p}{\pi} \rightarrow (3)$$

Form factor: The ratio of rms value to the average value of A.C is known as form factor.

$$\text{Form factor} = \frac{i_{rms}}{i_{ave}} = \frac{i_p/\sqrt{2}}{2i_p/\pi} = \frac{\pi}{2\sqrt{2}} = 1.11$$