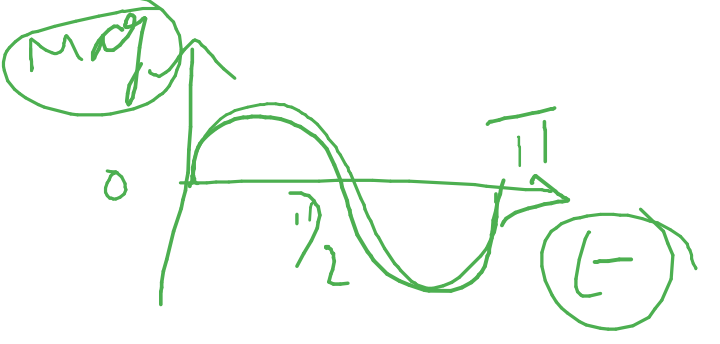
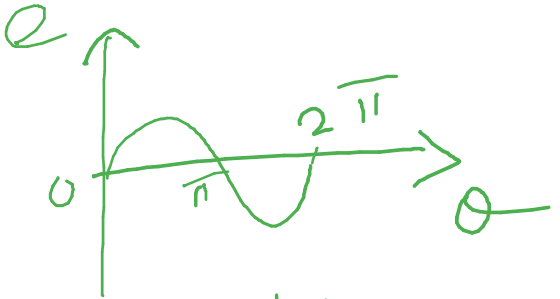
AC

RMS

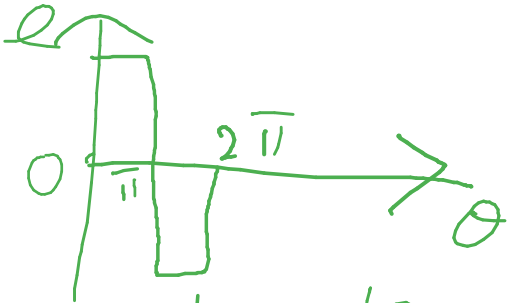
peak

average

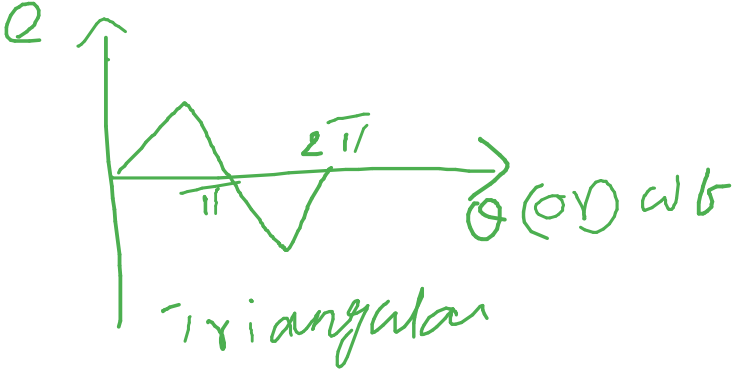




Sinusoidal

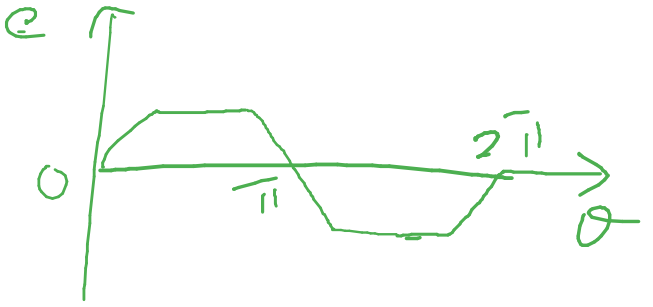


Rectangular

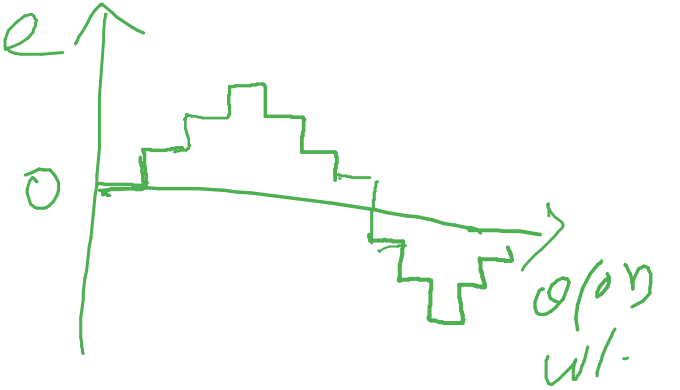


Triangular

Saw-tooth



Trapezoidal



Sym. waveform

$$I_{rms} = \sqrt{\frac{1}{(T/2)} \int_0^{T/2} i^2 dt} \quad (\text{or})$$

$$= \sqrt{\frac{1}{\pi} \int_0^{\pi} i^2 d\theta}$$

Unsymm. wave

$$I_{rms} = \sqrt{\frac{1}{T} \int_0^{T} i^2 dt} \quad (\text{or}) \quad \sqrt{\frac{2}{T_1} \int_0^{T_1} i^2 d\theta} \; .$$

RMS value: $\sqrt{\frac{\text{Area under the square curve for one cycle}}{\text{Period}}}$

Average value

sym I_{ave}: $\frac{1}{\pi}\int_0^{\pi} i\,d\theta$ (or) $\frac{1}{T/2}\int_0^{T/2} i\,dt$

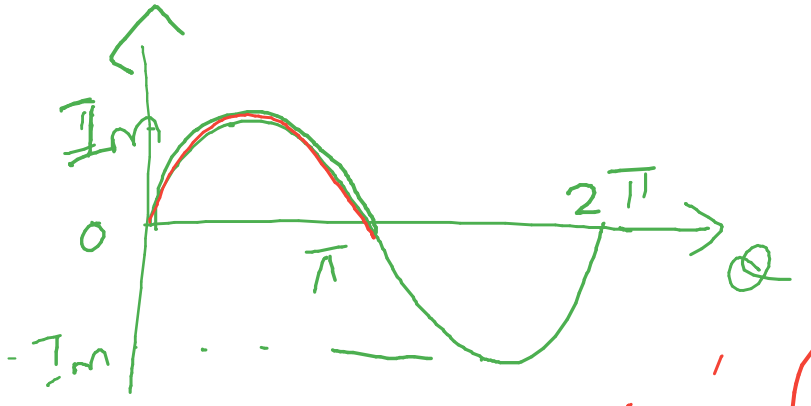
unsym. I_{ave}: $\frac{1}{2\pi}\int_0^{2\pi} i\,d\theta$ (or) $\frac{1}{T}\int_0^{T} i\,dt$.

Average Val : Area under the curve for one complete cycle / period

F.F : RMS value / Ave. value

P.F : Peak value / RMS value .

RMS, Av. value, FF, & PF



$i = I_m \sin\theta$

$$I_{ave} = \frac{1}{\pi}\int_0^{\pi} i\,d\theta$$

$$= \frac{1}{\pi}\int_0^{\pi} I_m \sin\theta \cdot d\theta$$

$$= \frac{I_m}{\pi}\left[-\cos\theta\right]_0^{\pi} = \frac{I_m}{\pi}\left[-1-1\right]$$

$$= 2I_m/\pi .$$

$$I_{rms} = \sqrt{\frac{1}{\pi}\int_0^{\pi} i^2 \, d\theta}$$

$$= \sqrt{\frac{1}{\pi}\int_0^{\pi} I_m^2 \sin^2\theta \, d\theta}$$

$$= \frac{I_m}{\sqrt{2}}$$

$$F.F = \frac{RMS}{AVG}$$

$$= \frac{I_m \cdot \pi}{\sqrt{2} \cdot 2 I_m}$$

$$= 1.11$$

P.F. = $\frac{\text{peak value}}{\text{RMS}} = \frac{I_m\sqrt{2}}{I_m} = 1.414$

$$I_{avg} = \frac{1}{2\pi}\int_0^{2\pi} i\,d\theta$$

$$= \frac{1}{2\pi}\int_0^{2\pi} i\,d\theta = \frac{1}{2\pi}\left[\int_0^{\pi} i\,d\theta + \int_{\pi}^{2\pi} i\,d\theta\right].$$

$$= \frac{1}{2\pi}\int_0^{\pi} I_m \sin\theta\,d\theta \neq 0 = \frac{I_m}{\pi}.$$

$$I_{rms} = \sqrt{\frac{1}{2\pi}\int_0^{2\pi} i^2 \, d\theta}$$

$$= \sqrt{\frac{1}{2\pi}\left[\int_0^{\pi} i^2 \, d\theta + \int_{\pi}^{2\pi} i^2 \, d\theta\right]}$$

$$= \frac{I_m}{2}$$

$$K_f = \frac{RMS}{AVG}$$

$$= 1.57$$

$$P.F = \frac{2}{}$$

I_{ave} = Area under one complete cycle / period

Area $= \frac{1}{2} \times 2 \times 5 = 5$

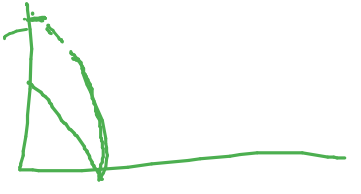
period: 2sec

$I_{ave} = 5/2 = \underline{2.5\,A}$.

I_{rms}: Area under squared curve for one complete cycle / period.

$= 1/3 \times 2 \times 25$

$= 50/3$

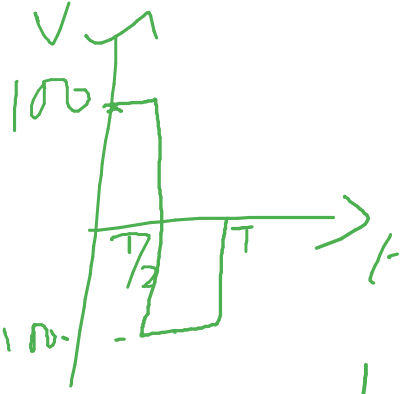


$\frac{1}{3} b h^2$.

$I_{rms} = \sqrt{\frac{50}{6}} = 2.88\ A$

$$F.F = \frac{2.88}{2.5} = 1.15$$

$$P.F = \frac{5}{2.88} = 0.473$$

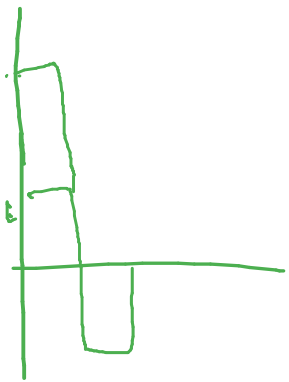


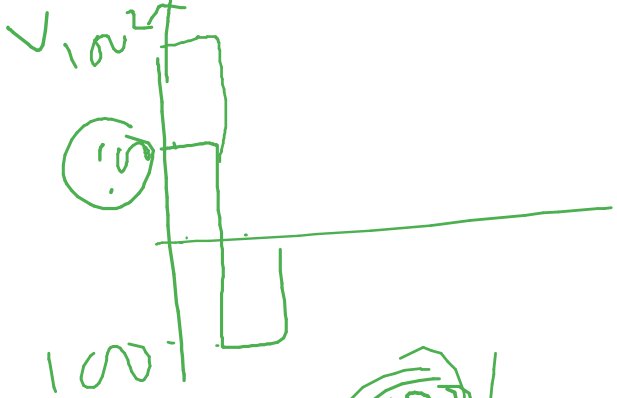
$$\text{Area} = 100 \times T/2 = 150\ V$$

$$I_{ave} = \frac{100\ V}{T/2}$$

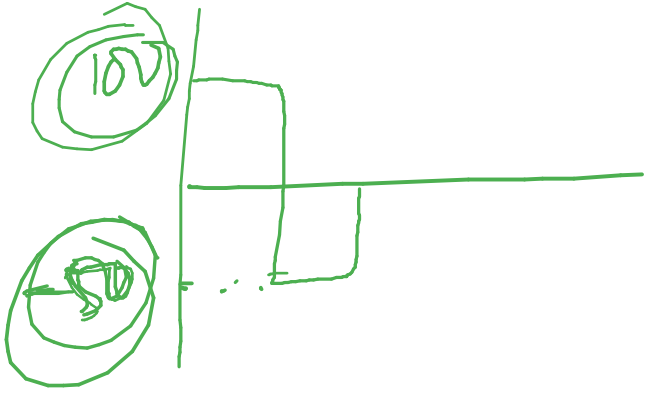
$$I_{rms} = \sqrt{\frac{100^2 \times T/2}{T/2}}$$

$$= 100$$





$$V_{rms} = \sqrt{\frac{1}{1/20} \int_{0}^{T_2} (i^2)\, dt}$$



$$= \frac{100 \times T/2 + (-50 \times T/2)}{T}$$

$$I_{ave} =$$

$$I_{rms} = \sqrt{\frac{100^2 \times T/2 + (-50)^2 T/2}{T}} = \sqrt{\frac{6250\,T}{T}}$$

$$K_f = 3.16 \quad K_p = \frac{100}{79.057} = 79.057$$