026 624

Standard form of alternating Quantity

Angular velocity $= \frac{\theta}{T}$

$\omega = \frac{2\pi}{T}$

Put $\frac{1}{T} = f$ $\boxed{\omega = 2\pi f}$

$v(\theta) = V_{pk} \sin\theta$

$v = V_m \sin\theta$

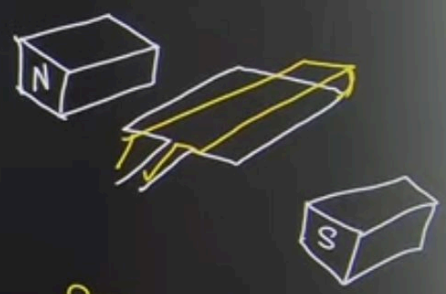
$v = V_m \sin\omega t$ $\theta = \omega t$

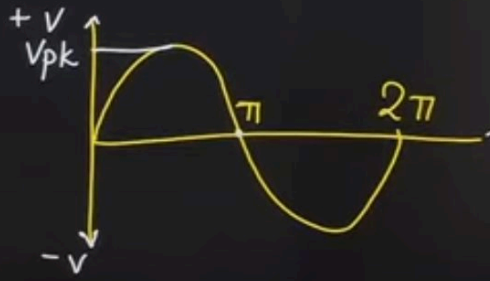
$v = V_m \sin 2\pi f t$ $\omega = 2\pi f$

360 → radian

2π

$180 = \pi$





Angular velocity 026 624

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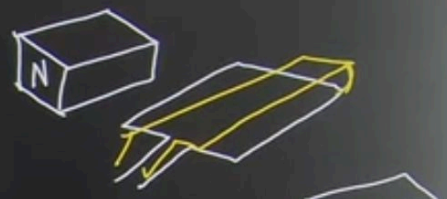

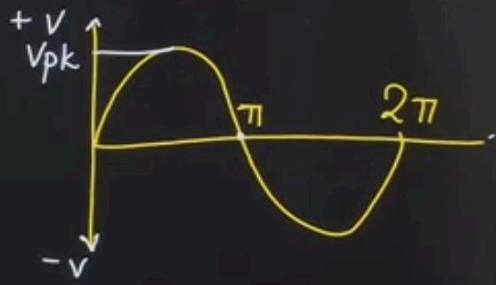

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Standard form of alternating voltage.

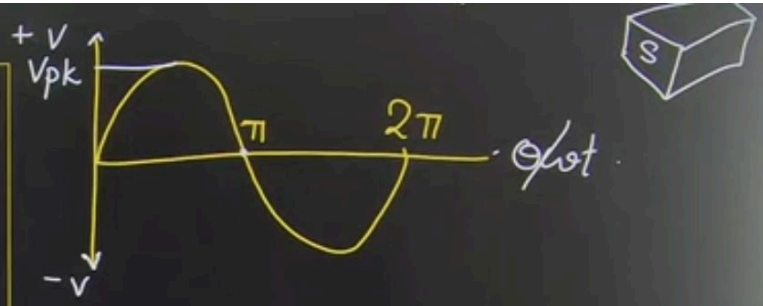
$v(\theta) = V_{pk} \sin\theta$

$v = V_m \sin\theta$

$v = v_m \sin\omega t$ $\quad \theta = \omega t$

$v = V_m \sin 2\pi f \cdot t$ $\quad \omega = 2\pi f$

$v = V_m \sin \frac{2\pi}{T} \cdot t$



Standard form of alternating current.

$i(\theta) = I_{pk} \sin\theta$

$i = I_m \sin\theta$

$i = I_m \sin\omega t$ $\quad \theta = \omega t$

$i = I_m \sin 2\pi f \cdot t$ $\quad \omega = 2\pi f$

$i = I_m \sin \frac{2\pi}{T} \cdot t$ $\quad f = \frac{1}{T}$

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Standard form of alternating voltage.

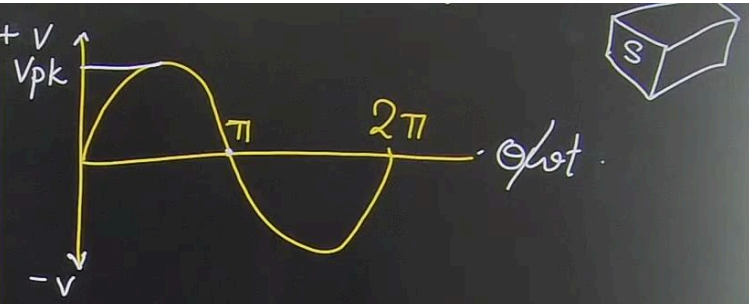
$v(\theta) = V_{pk} \sin\theta$

$v = V_m \sin\theta$

$v = V_m \sin\omega t$ · $\theta = \omega t$

$v = V_m \sin 2\pi f \cdot t$ · $\omega = 2\pi f$

$v = V_m \sin \frac{2\pi}{T} \cdot t$



Standard form of alternating current.

$i(\theta) = I_{pk} \sin\theta$

$i = I_m \sin\theta$ degree

$i = I_m \sin\omega t$ $\theta = \omega t$ [radian]

$i = I_m \sin 2\pi f \cdot t$ $\omega = 2\pi f$

$i = I_m \sin \frac{2\pi}{T} \cdot t$ $f = \frac{1}{T}$

An alternating current i is given by $i = 141.4 \sin 314t$. find

i) the maximum value ii) the frequency iii) The time period

iv) The instantenous value when time is 3 msec.

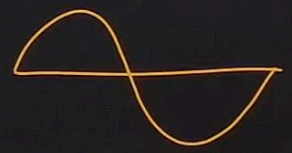
Compare $i = \underline{141.4} \sin \underline{314}t$ with standard form

$i = \underline{I_m} \sin \underline{\omega} t$.

The maximum value is $(I_m) = \underline{141.4\ A}$.

Frequency $= \frac{\omega}{2\pi} = \frac{314}{2 \times \pi} = 49.97 = 50\ Hz$.

Time period $(T) = \frac{1}{f} = \frac{1}{50} = 0.02$ sec.



$\leftarrow 0.02 \xrightarrow[\text{sec}]{} = 1$ cycle

1 sec = 50 cycles.

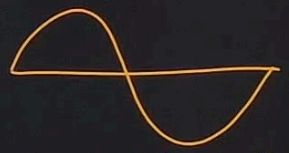
i) the maximum value ii) the frequency iii) the time period

iv) The instantenous value when time is 3 msec.

Compare $i = 141.4 \sin 314t$ with standard form

$i = I_m \sin \omega t$.

The maximum value is $(I_m) = 141.4\ A$.



$\leftarrow 0.02 \xrightarrow[sec]{} = 1$ cycle

Frequency $= \frac{\omega}{2\pi} = \frac{314}{2 \times \pi} = 49.97 = 50\ Hz$.

Time period $(T) = \frac{1}{f} = \frac{1}{50} = 0.02$ sec.

Instantaneous value at $t = 3 \times 10^{-3}$ sec.

$i = 141.4 \sin \left[314 \times 3 \times 10^{-3} \times \frac{180}{\pi} \right]$

$i = 114.35\ A$

$0.02 = 1$

$1 = x$

$x = \frac{1}{0.02}$

$= 50$.

1 sec = 50 cycles.

degree $= x \frac{\pi}{180}$ radian

radian $= x \frac{180}{\pi}$ degree.

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An alternating current of frequency 60 Hz has a maximum value of 12A. i) Write down the equation of the instantaneous value, ii) find the value of current after 1/360 sec, and iii) find the time taken to reach 9.6A for the first time

$i = I_m \sin \omega t$.

Given: $f = 60Hz$, $I_m = 12A$, $i = 9.6A$ in III case.

i) Instantaneous value. $\boxed{i = I_m \sin \omega t}$

$\omega = 2\pi f = 2 \times \pi \times 60 = 376.99 = 377$ rad/sec.

$\boxed{i = 12 \sin 377t}$.

ii) Value of current(i) at $t = 1/360$ sec.

$i = 12 \sin \left[377 \times \frac{1}{360} \times \frac{180}{\pi} \right]^\circ$.

$\boxed{i = 10.39A}$.

iii) $\boxed{i = 9.6A}$ t.

$i = I_m \sin \omega t$.

$9.6 = 12 \sin 377xt$

$\frac{9.6}{12} = \sin 377xt$.

radian.

$0.8 = \sin 377xt$.

$0.8 = \sin \left(377 \times t \times \frac{180}{\pi} \right)^\circ$.

$\sin^{-1}[0.8] = 377 \times t \times \frac{180}{\pi}$

$53.13 = \frac{377 \times 180}{\pi} xt$

$53.13 = 21600.5xt$

$t = \frac{53.13}{21600.5}$

$t = 2.45 \times 10^{-3}$

$\boxed{t = 2.45 msec.}$