Alternating Cur°

$i_{rms} = \frac{I_0}{\sqrt{2}}$

$V_{rms} = \frac{V_0}{\sqrt{2}}$

Transformers :

Step up :- voltage inc°

$$\frac{N_s}{N_p} = \frac{V_s}{V_p}$$

Step down :- voltage dec°

Efficiency :-

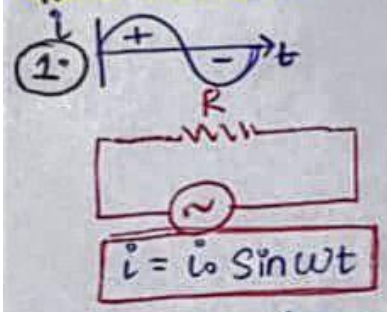
$$\eta = \frac{\text{output}}{\text{input}} = \frac{V_s I_s}{V_p I_p}$$

eddy current :-

→ when a metal piece is kept in a variable magnetic field.
→ core is seen laminated to reduce the energy loss and increase the efficiency.

CIRCUITS :-

1°



$i = i_0 \sin \omega t$

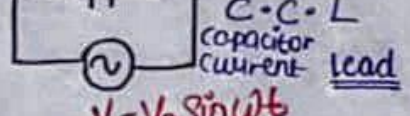
Phasor = Rotating vector

$V = V_0 \sin \omega t$

i & V are in same phase

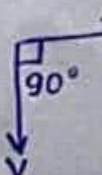
$V_0 = i_0 R$

2°



$V = V_0 \sin \omega t$

90° Phase difference,



$i = i_0 \sin(\omega t + 90°)$

$V_0 = i_0 X_C$

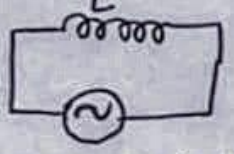
X_C = capacitive Resistance

$$X_C = \frac{1}{\omega C}$$

$\omega = 2\pi f$ → angular frequency

$V_{rms} = i_{rms} * X_C$

3



I.P.L → Inductor in Potential lead

$(i = i_0 \sin \omega t)$ *

$(V = V_0 \sin \omega t + 90)$ *

$V_0 = X_L i_0$

$X_L = \omega L$

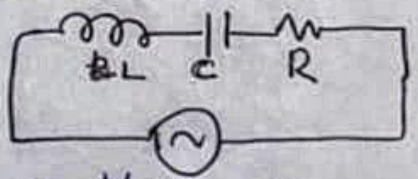
$\omega = 2\pi f$

* DC → f = Zero

↳ capacitor - ∞ Resistance

Inductor → $X_L = 0$, Resis = 0

LCR Circuit :-

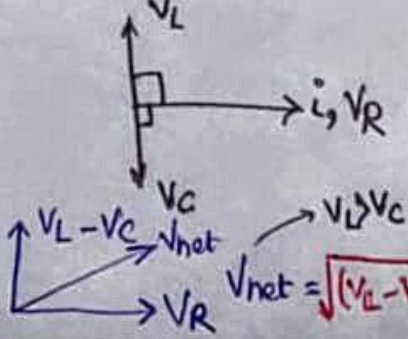


$V = V_0 \sin \omega t$

$V_R = I_0 R \sin \omega t$

$V_C = I_0 X_C \sin(\omega t - 90)$

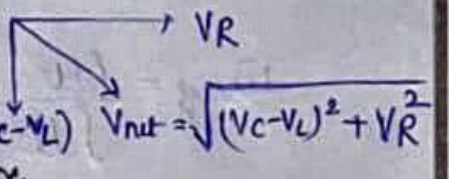
$V_L = I_0 X_L \sin(\omega t + 90)$



$V_{net} = \sqrt{(V_L - V_C)^2 + V_R^2}$

$V_C > V_L$

$\mu \rightarrow m \rightarrow \times 10^{-6}$



$V_{net} = \sqrt{(V_C - V_L)^2 + V_R^2}$



$(V_0)_{net} = (i_0)_{net} * Z$

$Z = \sqrt{(X_L - X_C)^2 + R^2}$

$\cos\phi = \frac{R}{Z}$ Power factor

$\tan\phi = \frac{X_L - X_C}{R}$

Resonance :

$(i_0)_{max} = \frac{V_0}{R}$, $X_L = X_C$

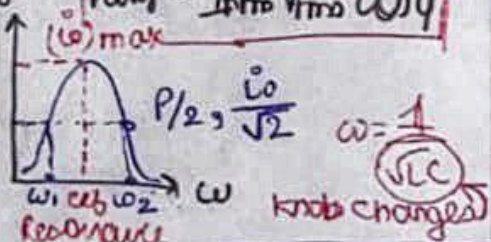
and $Z_{min} = R$

$R_F = \frac{1}{\sqrt{LC}}$

thus $(i_0)_{max} = \frac{V_0}{R}$

$\omega = \frac{1}{\sqrt{LC}}$

i_0



Pavg = $I_{rms} V_{rms} \cos\phi$

$= \omega_2 - \omega_1 =$ Bandwidth

Quality factor : Ratio

$$Q = \frac{\text{Resonant freq}}{\text{Bandwidth}} = \frac{X_L}{R_F}$$

Quality factor & Sharpness

→ Blunt graph is not good, where as a sharp graph is considered ideal.

$$I_{avg} = \frac{\text{Area}}{\int dt}$$

$$\frac{\frac{1}{2} i_0 T}{T}$$

$$i_{avg} = \frac{i_0}{2}$$

#Root mean square:

$$i_{rms} = \frac{i_0}{\sqrt{2}}$$