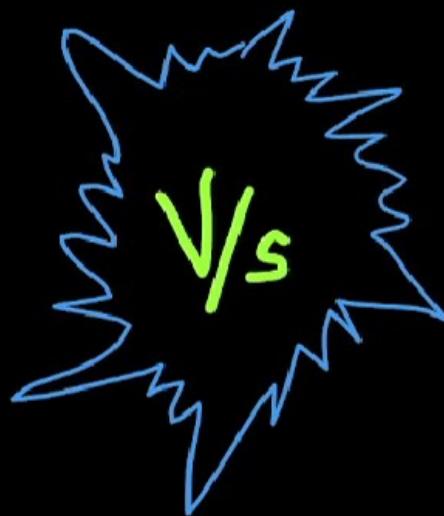


\bar{P}

$\bar{\phi}$



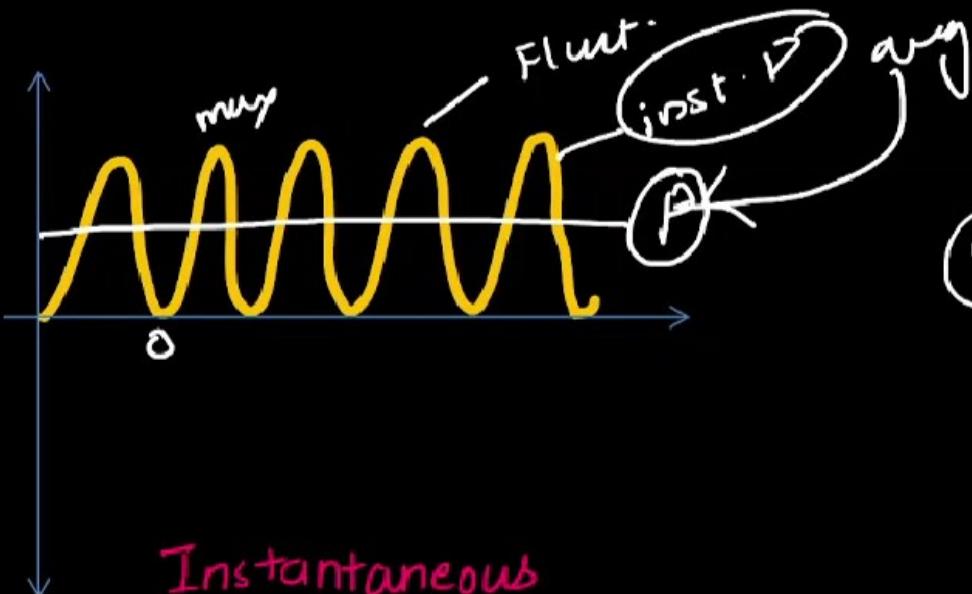
Ins. P

Ins. ϕ

Instantaneous power eqn

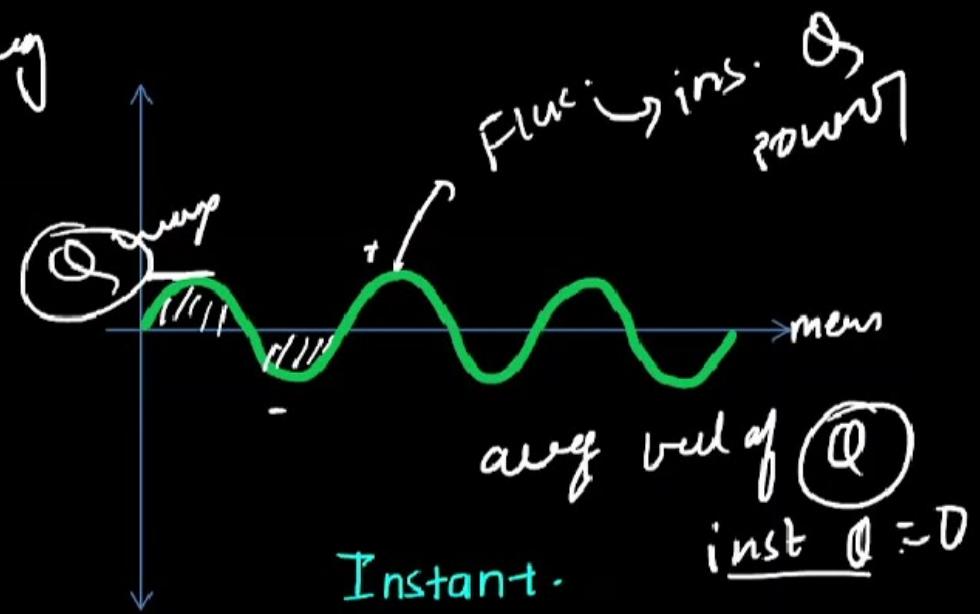
$$P = \underbrace{VI \cos \phi (1 - \cos 2\omega t)}_{\text{Instantaneous active power}} + \underbrace{VI \sin \phi \sin 2\omega t}_{\text{Instantaneous reactive power}}$$

$$\text{Ins. Power} = \text{Ins. active} + \text{In reactive}$$



Instantaneous
active power

\textcircled{P} , avg of
inst. $P \approx P$ Active power



Instant. $\text{inst. } Q = 0$

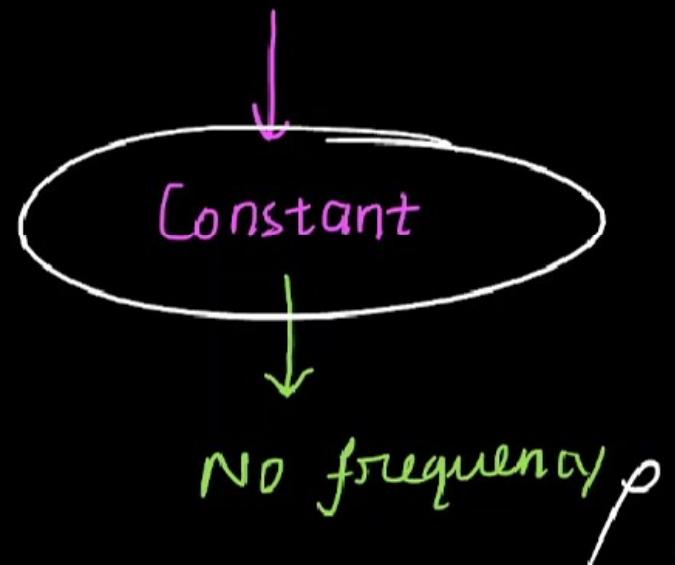
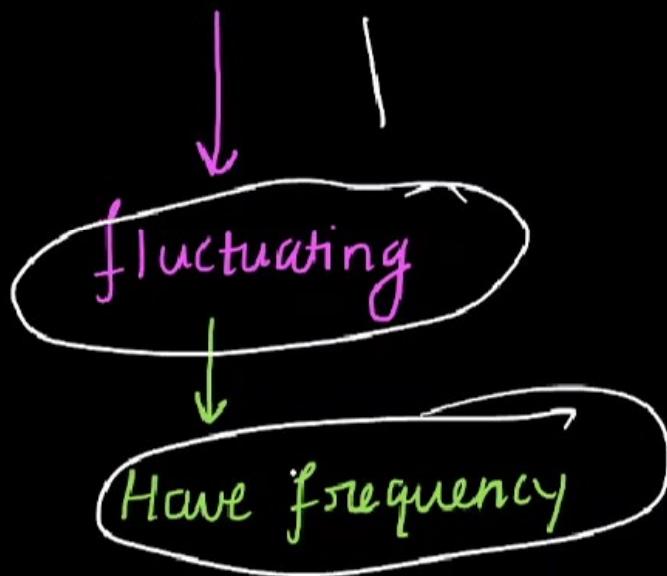
Reactive
power

\textcircled{Q} , max^m of
inst. Q Reactive power

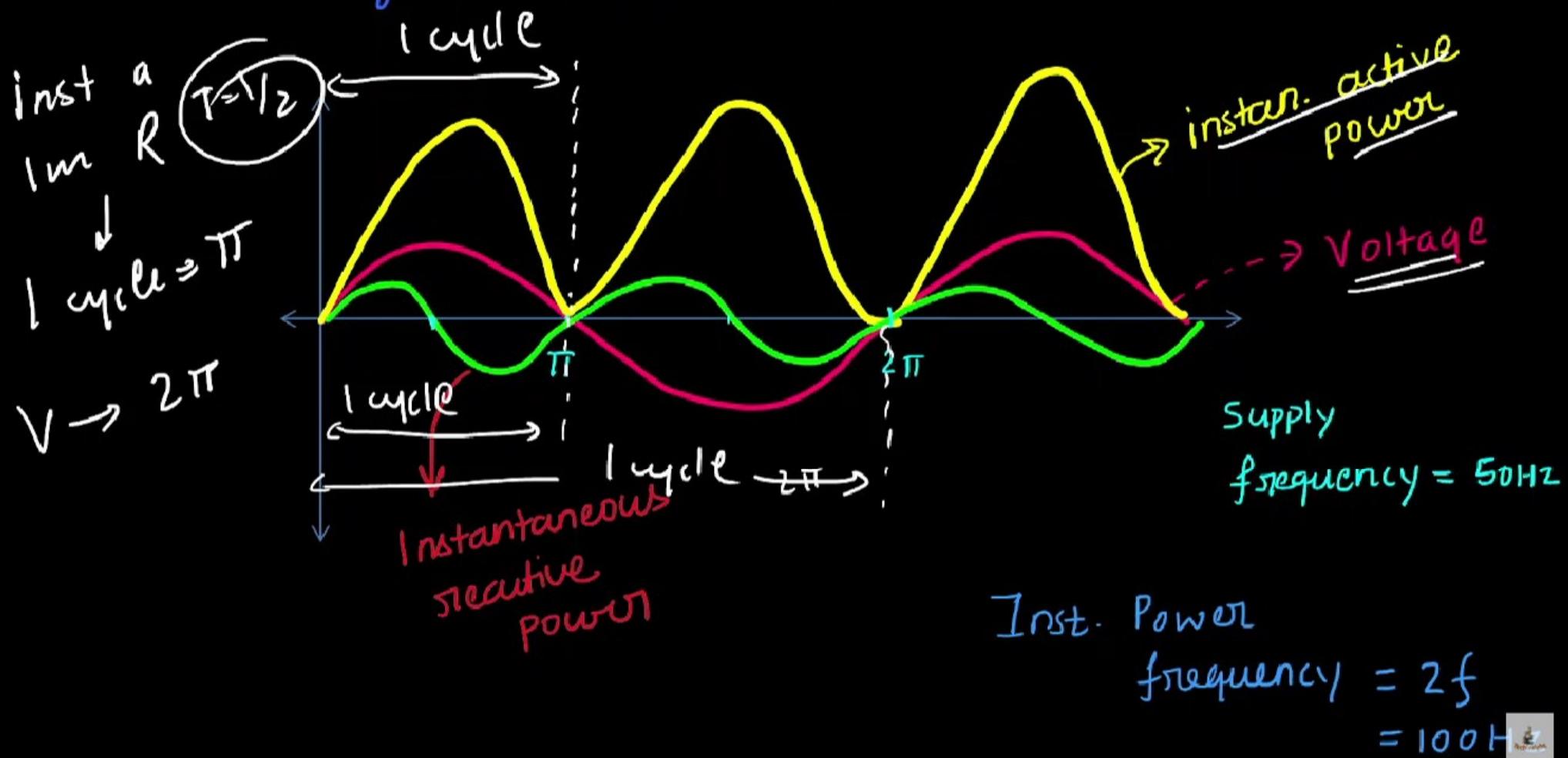
INSTANT Vis NORMAL

Instant P

Instant Qs



Frequency of Instantaneous Active and Reactive power



mathematically

$$\text{Supply volt} = V_m \sin \omega t \quad \xrightarrow{\text{supply frequency}}$$

$$\text{Ins. Active power} = VI \cos \phi (1 - \cos 2\omega t) \quad \xrightarrow{\substack{\text{Ins. active} \\ \text{power} \\ \text{freq}}}$$

$$\text{Ins. Reactive power} = VI \sin \phi \sin 2\omega t \quad \xrightarrow{\substack{\text{Ins. Reactive power} \\ \text{frequency}}}$$

$$\text{Ins. Power} = Q$$

$$\text{Instan. power freq.} = \boxed{Q \times \text{Supply freq.}}$$