Sinusoidal source supplying a load

Let the instantaneous voltage be

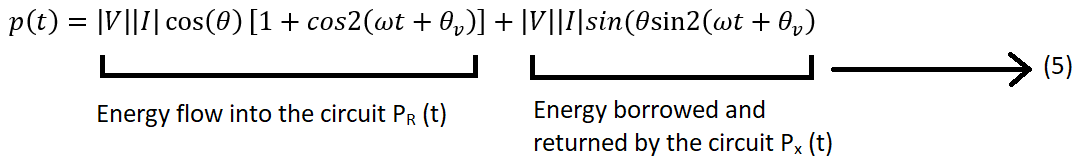
And the instantaneous current is given by

The instantaneous power p(t) delivered to the load is the product of voltage v(t) and current i(t) is given by

Add extra

The root mean square value of and root mean square value of and

Now above equation written in terms of rms value is reduced to



Where is the angle between voltage and current, or the impedance angle. is positive if the load is inductive, (i.e., current is lagging the voltage) and is negative if the load is capacitive (i.e., current is leading the voltage).

Now open the brackets

The original value with 2 multiple harmonics

The average power delivered by load is

This is the power absorbed by the resistive component of the load and is also referred as the active power or real power.

The product of the rms voltage value and the rms current value is is called the apparent power and is measure in units of volt ampere.

The product of the apparent power and the cosine of the angle between voltage and current yields the real power.

Cosine is the power factor, when the current lags the voltage, the P.F is considered as lagging power factor. When the current leads the voltage, the power factor is considered as leading PF.

The second component of )5)

The original value with 2 multiple harmonics. This is cllaed as Reactive Power (Q)

For Inductive load current is lagging the voltage

**Example 2.1**

**The supply voltage as shown in Figure is given by v(t) = 100**