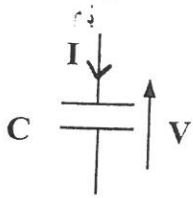


THE CAPACITOR

The Capacitor



symbol

The fundamental property of a capacitor is that it is able to store charge energy when there is a voltage between its terminals.

In theory capacitors do not dissipate energy, however, in practice capacitors may have some resistance and hence may dissipate some energy.

Capacitance may be defined as the charge per unit potential difference. Therefore $C = Q/V$ or $Q = C \cdot V$

C = capacitance in FARADS, Q = charge in COULOMBS and V = voltage across the capacitor in VOLTS.

A capacitor can only store so much charge at a given voltage, increasing the capacitance of the capacitor means that more charge may be stored at the same voltage.

Energy stored in capacitor = $\frac{1}{2} C V^2$ Joules (J)

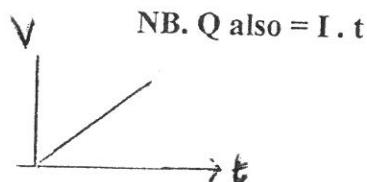
The relationship between V and I in a capacitor is given by:

$$V = \frac{1}{C} \int I \cdot dt \quad \text{and} \quad I = C \cdot \frac{dV}{dt}$$

Now if the applied voltage across the capacitor is constant then it will either be fully charged or uncharged. In either case dV/dt will equal 0 and hence I will = 0. Therefore at DC (where the applied voltage is constant) the capacitor behaves like an open circuit.

If, however, we apply a constant current to the capacitor, the terminal voltage will be given by;

$$V = \frac{1}{C} \cdot I \cdot \int_{-\infty}^t dt \quad \text{which equals} \quad \frac{I \cdot t}{C}$$



The V and I shown above is assumed to be dc. However, when we apply ac to capacitors their ac behaviour is quite different from their dc behaviour.

RESISTO. P48