Chapter 2: Circuit Elements

Elements can be diricles to two main Types:-

- **Active Elements**: Delivers power
  - Independant Sources
    - Incl. Voltage Sources: فيه الجهد لا يعتمد على التيار الذي يمر فيها
      - AC
      - DC
    - Incl Current Sources: فيه التيار لا يعتمد على الجهد الذي يمر فيها
  - Dependant sources: فيه تتأثر من عنصر آخر من الدائرة
    - There are 4 Types:-
      - VCVS
      - VCCS
      - CCVS
      - CCCS
- **Passive Elements**: Absorbes Power
  - Resistors
    - Unit: ohm
    - ohm's law:-
    - $V(t) = i(t)R$
    - or
    - $V(t) = -i(t)R$
  - Conductors
    - Unit:- Farad
    - law:- $i_c(t) = C\frac{dV_c(t)}{dt}$
    - $V_c(t) = V_c(0^-) + \int_{0^-}^{T} \frac{1}{C} i_c(t)\,dt$
  - Inductors
    - Unit: Henry
    - law:- $V_L(t) = L\frac{di_L(t)}{dt}$
    - $i_L(t) = i_L(0^-) + \int_{-0}^{T} \frac{1}{L} V_L(t)\,dt$

- Resistance And Conductance
  - R
  - G

$G = \frac{1}{R}$ Ω^{-1}, 25, Simens or mho

Two special Resistor Values:-

- Short Circuit
  - V = 0 volts
  - I = has a value
  - R = 0
  - G = ∞
- Open Circuit
  - V = has a value
  - R = ∞
  - G = 0
  - I = 0

If you have a capacitor in a circuit for a long time Then $i_c(t) = 0$ ⇒

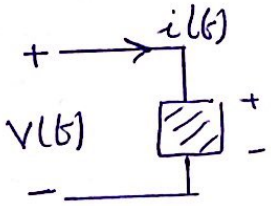
If you have an inductor for a long time $V_L(t) = 0$ ⇒

Power :-

The sum of Power in any circuit equals zero

$$\Sigma P_{supplying} = \Sigma P_{absorbing}$$

If the element Polarity is same as i direction Then it's absorbing Power :- $P(t) = V(t)\, i(t)$



If the element Polarity is in the opposite direction of i direction Then it's supplying Power : $P(t) = -i(t)\, V(t)$