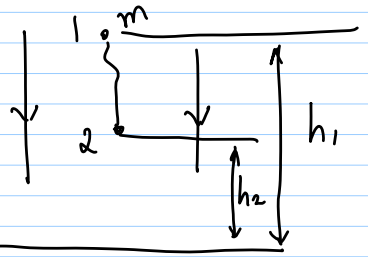
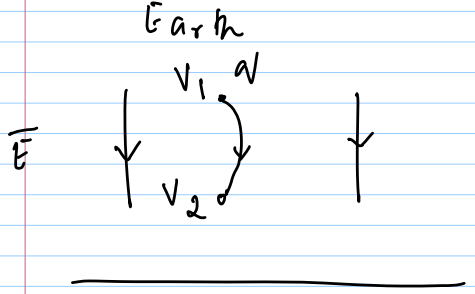
13/1/15

Lec 1



$\Delta E = mg(h_1 - h_2)$



$\Delta E \Rightarrow$ potential difference
$\Rightarrow$ voltage

$\Delta E = q(V_1 - V_2)$

Physics

q & $\bar{E}$

EE

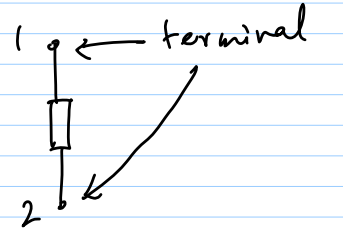
I & V

I = rate of flow of charge

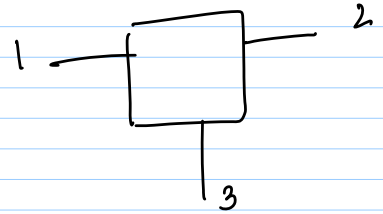
$= \frac{dq}{dt}$

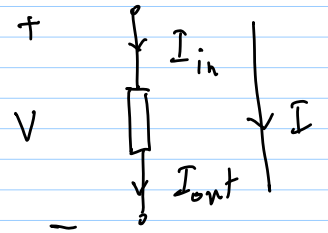
* Electromagnetic Fields
* Solid State Devices

Electrical elements



2-T element



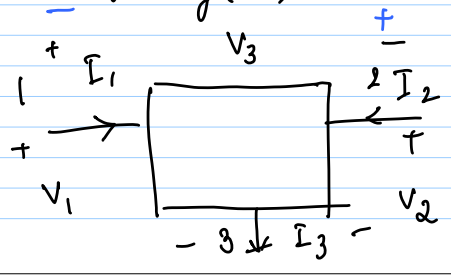


* no accumulation of charge

$I_{in} = I_{out}$

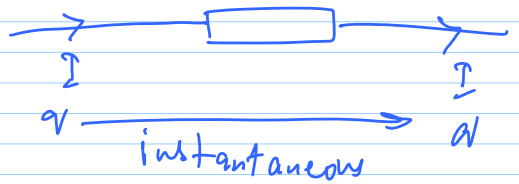
$I = f(V)$

$V = g(I)$



$I_3 = I_1 + I_2$

$V_3 = V_1 - V_2$

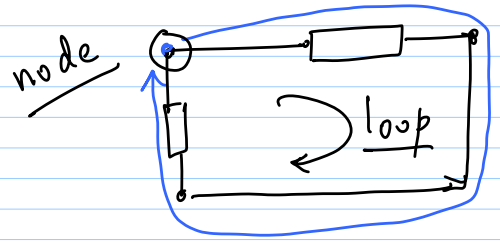


Kirchhoff's Laws

1) Kirchhoff's Voltage Law (KVL)
2) Kirchhoff's Current Law (KCL)

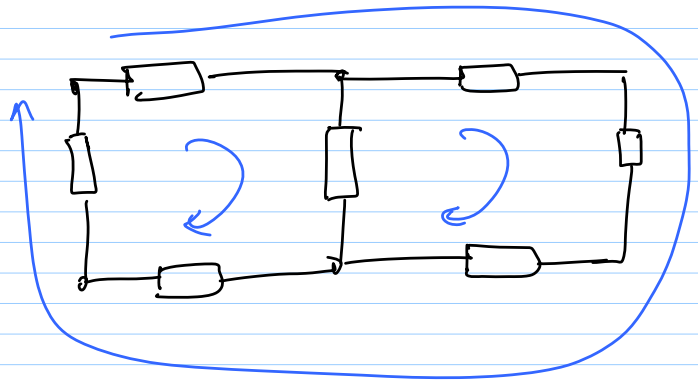
Electrical Circuit

Interconnection of 2 or more elements

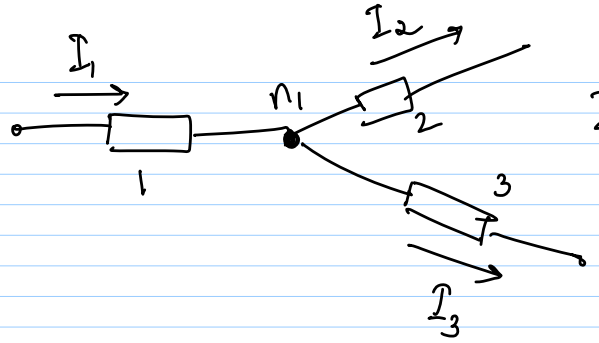


node – point of connection between 2 terminals of diff. elements

loop – start from a node
traverse through elements
arrive back @ same node



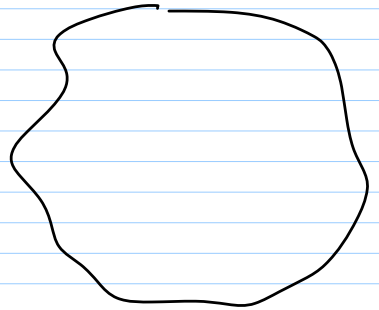
KVL $\sum V_{\text{around a loop}} = 0$



$I_1 = I_2 + I_3$

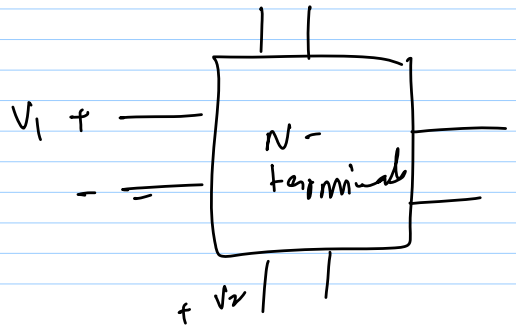
KCL $\sum I_{\text{entering a node}} = 0$

@ n_1 $\quad I_1 + (-I_2) + (-I_3) = 0$



N nodes

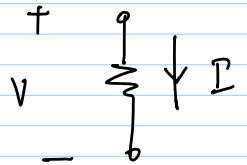
M loops



N terminals

2-T elements

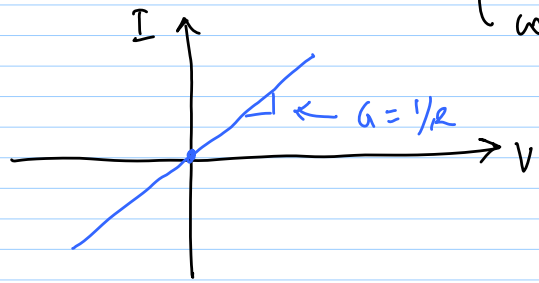
1) Resistor



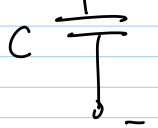
$V = IR$ ← resistance (Ω)

$I = G \cdot V$; $G = 1/R$

↑ conductance (S)

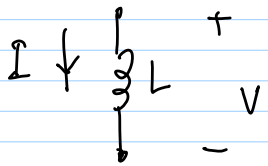


2) I ↓ + Capacitor

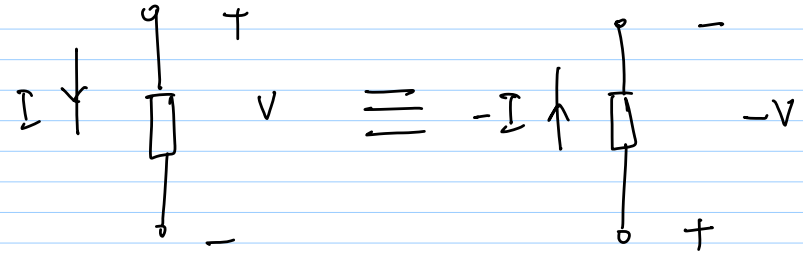


$I = C\,dV/dt$

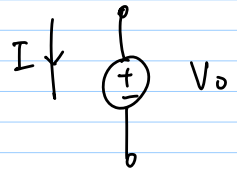
3) Inductor



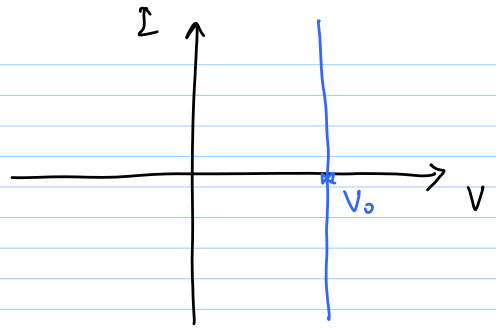
$V = L\dfrac{dI}{dt}$



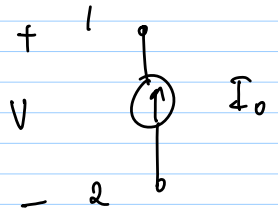
4) Voltage Source



pot. diff. across terminals is V_0 regardless of I



5) Current Source



Current through element independent of V