Lecture 5

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- Dependent and real sources

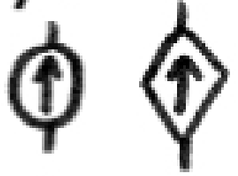
Dependent sources

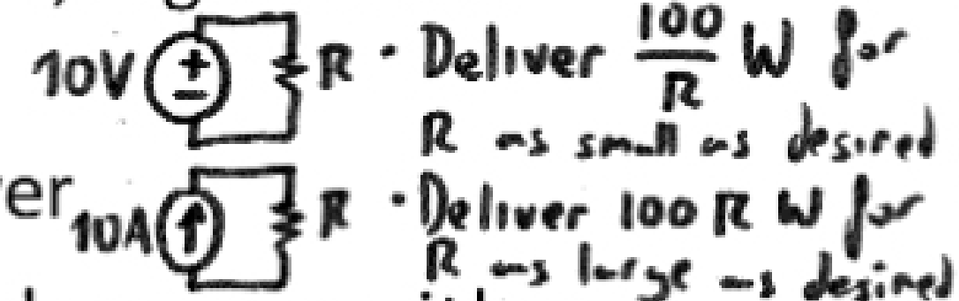
- Do not exist as such, just a model for other elements (e.g. amplifiers)
- Their value depends on other quantities in the circuit
- Four types: (see P39 of the book)
  - Voltage controlled voltage source (VCVS) 
  - Current controlled current source (CCCS) 
  - Voltage controlled current source (VCCS) 
    - Transconductance parameter (unit S)

      g_m units $\frac{A}{V}$ = Siemens
  - Current controlled voltage source (CCVS) 
    - Transresistance parameter (unit Ω)

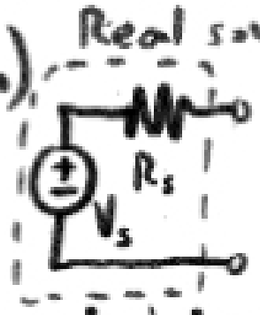
      r_m units $\frac{V}{A}$ = Ohm
- Usually drawn with a shared terminal, but not necessary

Real sources

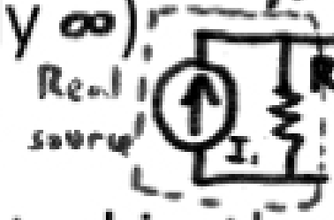
- Ideal sources are represented by:
  - Voltage  Current 
  - Assumed to provide constant V or I, regardless of what is connected to them
  - Capable of delivering infinite power



- Real sources behave like an ideal source with an internal resistor (No symbol for them)
  - Voltage (Rs very small, ideally 0)
    - Is almost ideal for loads >> Rs
  - Current (Rs very large, ideally ∞)
    - Is almost ideal for loads << Rs
  - Some of the power gets wasted in the internal resistor

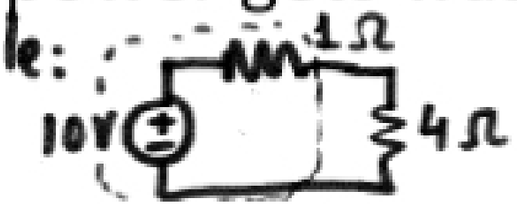


If connected to a large R_L it delivers V_s as promised. If connected to small R_L it delivers less (e.g. if $R_L = R_s$ it delivers $V_s/2$.



Delivers I_s if connected to small R_L, but less for big load

For example:



Source generates $10 \cdot 2 = 20$W but only $8 \cdot 2 = 16$W are consumed by 4Ω resistor.