Anthony Ding

Week 7 Cribsheet

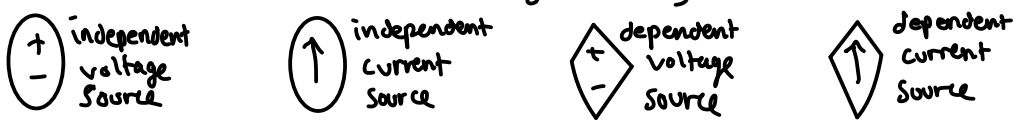
NOTES: 15, 16

SUPERPOSITION

when useful: Circuits with multiple <u>independent</u> sources

independent: value of source does not rely on another element

dependent is opposite. can tell by drawing: (circle vs rhombus)



how to do: for each indep. source: (important!)

- <u>zero out</u> all other (indep.) sources
- find circuit quantity for zeroed out circuit

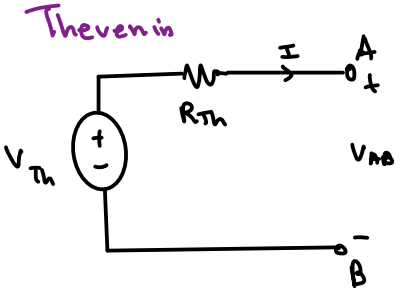
sum up all circuit quantities found

zero out: voltage source → 0V or wire / short

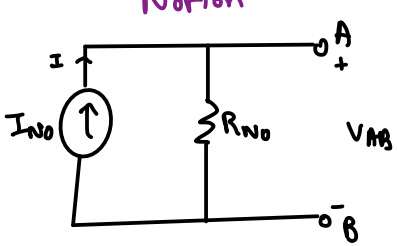
current source → 0A or open circuit

EQUIVALENCE

Thevenin



Norton



how to find both Thevenin + Norton:

1. measure voltage across terminals. This is V_{Th}
2. draw a wire between terminals. current through it is I_{NO}
3. zero out indep. sources and erase wire from step 2
4. apply Vtest or Itest and measure Itest or Vtest (the other)
5. $R_{Th} = R_{NO} = \frac{V_{test}}{I_{test}}$

CAPACITORS

Capacitance $C = \frac{Q}{V} = \frac{\text{charge on plate}}{\text{voltage across}}$ unit: Farad (F)

$C = \varepsilon \frac{A}{d} = \varepsilon \frac{\text{x section area}}{\text{distance}}$ ε = permittivity constant

Some important formulas (making use of $I = \frac{dQ}{dt}$)

$I = \frac{dQ}{dt} = C\frac{dV}{dt}$ ★ super important!

capacitor voltage with initial time 0: $V_C(t) = \frac{I}{C}t + V_C(0)$

general capacitor voltage eqn: $V_C(t) = \frac{I}{C}(t - t_0) + V_C(t_0)$

energy: $E = \frac{1}{2}QV = \frac{1}{2}CV^2 = \frac{1}{2}\frac{Q^2}{C}$

Series: $C = C_1 \| C_2 = \frac{1}{\frac{1}{C_1}+\frac{1}{C_2}} = \frac{C_1 C_2}{C_1 + C_2}$

parallel: $C = C_1 + C_2$

} opposite of resistors!

$\|$ (parallel operator) is commutative: $a \| b = b \| a$

associative: $(a \| b) \| c = a \| (b \| c)$