

EE Midterm 2 Midterm 2

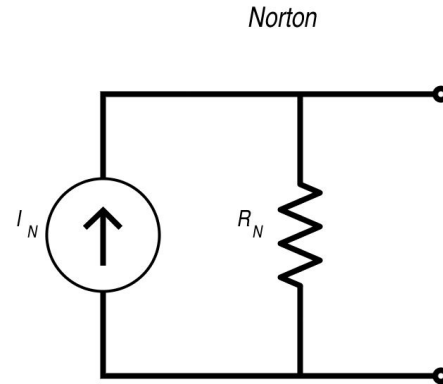
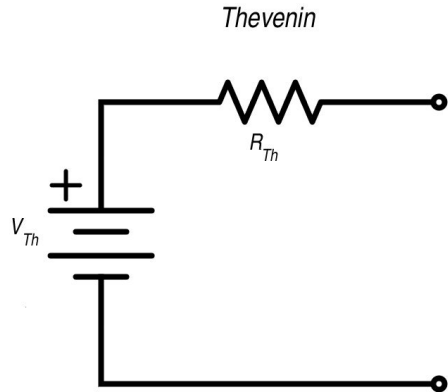
Useful Stuff to Put on Midterm 2 Cheat Sheet

Basic Circuit Information

- $V = IR$ (Ohm's Law)
- Resistance is directly proportional to length, indirectly proportional to area
- $P = IV$
- Power is conserved
- $Q = CV$
- Capacitance is directly proportional to area, indirectly proportional to distance

Thevenin / Norton Equivalent

- Equivalence simplifies a circuit into one independent source and one resistor, while still having the same output voltage and current at two specified nodes
 - Thevenin Equivalent - independent source is a voltage source
 - Norton Equivalent - independent source is a current source
- Preserves all behavior of the circuit outside at the specified nodes

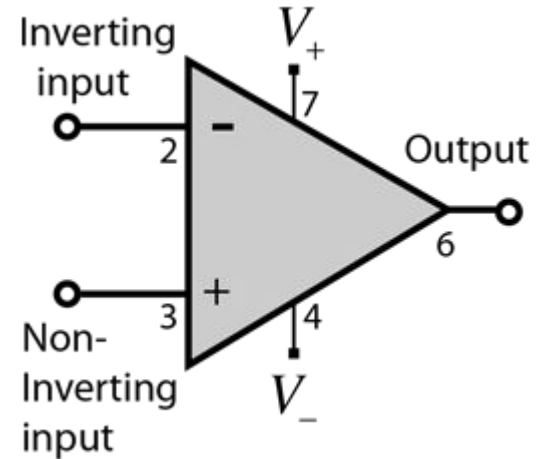


Calculating Thevenin / Norton Resistance

- Find the equivalent resistance between terminal a and b, with all independent sources nullified
- When nullifying independent sources:
 - Voltage sources become wires
 - Current sources become open wires
- Dependent sources should not be nullified

Operational Amplifiers (Op-Amps)

- Op-Amps useful for comparing voltages in order to decide what voltage to output
- Op-Amps DO NOT OUTPUT INFINITE VOLTAGE; capped by Voltage sources on it
- Golden Rules of Op-Amps
 - 1. $I_+ = I_- = 0$ (currents through inputs are always 0A)
 - 2. $U_+ = U_-$ (the inputs have same potential) (only in negative feedback and ideal op-amp)



Op-Amps In Negative Feedback

- In order to solve negative feedback problems, one should use KCL at every node, golden rules, and $I = V / R$
- This will simplify expressions and help solve for V_{out} , the output voltage
- Some useful negative feedback op-amp configurations are
 - Unity Gain Buffer - prevents loading, acts as a buffer
 - Non-Inverting Amplifier - amplifies input values, also acts as buffer
 - Inverting Amplifier - amplifies input values and flips sign; causes loading
 - Transresistance Amplifier - converts current to voltage