Test #2 Overview

Material covered
- The following chapters and sections in *Electric Circuits, 9th Edition* by Nilsson
  - Chapter 4, Sections 1 - 8 (node and mesh equations) ≈67%
  - Chapter 5 (operational amplifiers) ≈33%
- Related homework assignments: HW #4-6
- Typical format:
  - 2 node equation problems
  - 2 mesh equation problems
  - 2 op amp problems

Node Equations
Node voltages are *relative voltages* that depend on the reference (ground)
Be able to find component current, voltage, or power using node voltages
# Node Equations = # Nodes - # Voltage Sources – 1
In general, write node equations at:
- All nodes not adjacent to a voltage source or to the ground node
- All supernodes
Supernodes - needed when the circuit contains voltage sources that are not adjacent to the ground
Dependent sources - redefine the control variable in terms of node voltages

Mesh Equations
Limited to planar circuits
Be able to find component current, voltage, or power using mesh currents
# Mesh Equations = # Meshes - # Current Sources
In general, write mesh equations at:
- All meshes without current sources
- All supermeshes
Supermesh - needed when the circuit contains internal current sources (not on the outer edge)
Dependent sources - redefine the control variable in terms of mesh currents

Operational Amplifiers
Ideal amplifiers only - no models
Basic rules for analyzing an ideal op amp:
- \( V^+ = V^- \)
- \( I^+ = I^- = 0 \)
- All voltages are node voltages (w.r.t. a common ground), so rely on node equations
Two common op-amp limitations:
- \( V_o(max) = V_{sat} \) is limited by the supply voltage, \( \pm V_{DC} \).
- \( I_o(max) \) is generally specified by the manufacturer
Key analysis tool: node equations
Do not memorize any equations for common op amp configurations (such as \( V_o = -(R_f/R_1)V_{in} \) for the inverting amplifier).
You do not need to know the dependent source model for an op amp (although we will use it in PSPICE).

**Study hint:**
- Work enough problems so that you become fast at solving them.
- Pick any of the node or mesh equations problems in the text and try solving them twice: once with node equations and once with mesh equations.