Lecture 14 - Midterm Review

Administrivia: My office hours today will be in 277 Cory, instead of E3m from 5pm-9pm. If you come after 6:00 pm, please wait in front of 2nd floor entrance, someone will let you in!
Mid term → Next Thursday (03/10/05)

No class on 03/10

2 p.m - 5 p.m in CSE 105

25% makeup

6 p.m - 9 p.m in 1 Pimentel

No blue books necessary.

Next week: Tuesday (03/15/05)

In-class Q/A (continued)

Tutor's review session in 10 Evans from 5-7
What's on midterm

1. Nodal analysis
2. Thevenin/Norton
3. Source transformations
4. RC/RL circuits
5. Dependent sources
6. Maximum power transfer
7. Voltage divider

What isn't
mesh analysis
Superposition you can use if you want to
"No lab"
How to prepare for MT 1

(1) Quickie: From Review problem 6 should not take you more than 5 minutes.

\[ E_S = 6 \text{ V} \]

\[ V_{AB} = \_ \_ \_ \_ \]

Concept(s): Voltage across parallel elements | Voltage divider
\[ U_A = \left( \frac{10k}{10k + 20k} \right) \times 6 = 2 \, V \]

\[ V_B = \left( \frac{20k}{10k + 20k} \right) \times 6 = 4 \, V \]

\[ U_{AB} = V_A - V_B = -2 \, V \]

\[ U_A = 2 \, V \] (kuv)

refers to voltage at node A w.r.t. ground. \( \frac{1}{f} \)
\[ V_{dc} = i (1 - 3 \, \text{k} \Omega) = \left(1 \, \text{mA} + 2 \, \text{mA} + 3 \, \text{mA}\right)(1 - 3 \, \text{k} \Omega) \]
\[ = (6 \, \text{mA})(1 - 3 \, \text{k} \Omega) \]
\[ = 7.8 \, \text{V} \]
(a) Node analysis: Set up equations only

(b) Setup node equations to find the unknown node voltages. Do not solve!

\[ i_1 = \frac{5 - V_A}{5 \Omega} \]

\[ i_2 = \left(1 + C\right) \frac{1}{L} \int u_{in} \, dt \]

\[ i_3 = ? \]

\[ i_4 = \frac{1}{L} \int u_{in} \, dt \]

\[ i_5 = (N - 1) \times i_4 \]
Step 1: Label ground node

Step 2: Label unknown node voltages

Step 3: Write KCL equations at unknown node (or) supernode

\[ \text{KCL @ } V_4: \quad 1 = 1.2 + 1.3 \quad \text{KCL @ } V_8: \quad 1.2 = 1.4 + 1.5 \]

Step 4: Rewrite currents in KCL in terms of node voltages
\[
\left( \frac{5 \Delta V_A}{5 \Delta t} \right) = (1 \mu F) \frac{dV_A}{dt} + i_A
\]

\[
i_A = \frac{1}{6 \mu F} \int_{0}^{\Delta t} b dt + \left( \frac{V_{ib} - 10}{6 \mu F} \right)
\]

Constant eqn. \[ V_b - V_A = 3V_{sc} \]

\[ V_{2c} = V_b \]
CQ. 1. Suppose...

\[ U_B + U_C = 10 \]

\[ U_B - U_C = 10 \]

\[ U_C = U_B - 10 \]
Miscellaneous stuff about midterm

5. a) $1\text{mA}$
   b) $2\times$ ignore (not at terminal)

2. c) $5\text{V}$
   d) $1\text{mA}$
   e) "dodl"

2. f) $2\times$ ignore (not at terminal)
Note:

\[ i_0 = \frac{V_x}{R} \]

Cannot ignore it because you need \( R \) to find \( i_0 \).

RC \[ \rightarrow \] Homework 6

(4) If you understand all homeworks \( \Rightarrow \) you should be set. 😊
Q: If you have a circuit with both independent and dependent sources, can you do source functions on independent sources?

A: Depends on the circuit.

E.g.: Not recommended, but you could do it. In this case, it's actually easy because of infinite.
"Wisdom", I thought. "Isn't it the case toward the end of class?"

In this case, you could "move $V_{in}$" out of the box.

Like someone in the first row pointed out,
\( v_a \) is the voltage across \( ab \), so in this case source transform is easy. But, consider this:

\[
\begin{align*}
\text{Note that you can do a source transform, but you have to keep track of where } \text{in is!}
\end{align*}
\]