HKN ECE 110 Review Session Exam 2

COREY SNYDER
STEVEN KOLACZKOWSKI
# Office Hours!

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<th>Time</th>
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Voltage Divider and Current Divider

• Voltage Divider Rule (VDR)
  • Can only be applied to resistors in series

• Current Divider Rule (CDR)
  • Can only be applied to resistors in parallel

\[
V_1 = \frac{R_1}{R_1 + R_2} V \\
V_2 = \frac{R_2}{R_1 + R_2} V \\
I_1 = \frac{R_2}{R_1 + R_2} I \\
I_2 = \frac{R_1}{R_1 + R_2} I
\]
Power and Labeling

• We know that power can be expressed in three ways: \( P = IV = I^2R = \frac{V^2}{R} \)
• If the value of power is positive, the element is absorbing power
• If the value of power is negative, the element is supplying power
• Standard vs. Non-Standard Labeling
  • Standard: \( P = IV, V = IR, \) Current goes + to -
  • Non-Standard: \( P = -IV, V = -IR, \) Current goes − to +
Thevenin and Norton Equivalents

• We can express any linear circuit as a simple circuit involving a source and a resistor (Wow)
  • More on this in ECE 210!

• We want to find $V_{OC}$, $I_{SC}$, and $R_{eff}$

• If we find two of these parameters, we can find the third through Ohm’s Law!

• If current is defined as standard:
  • $I = \frac{-I_{SC}}{V_{OC}} V + I_{SC}$

• If current is defined as non-standard:
  • $I = \frac{I_{SC}}{V_{OC}} V - I_{SC}$
$V_{\text{RMS}}$

- Voltage root mean square

\[ V_{\text{rms}} = \sqrt{\frac{\int_0^T (v(t))^2 \, dt}{T}} \]

- $V_{\text{rms}}$ (square wave) = $V_{\text{peak-peak}} \times \sqrt{\text{Duty Cycle}}$

- $V_{\text{rms}}$ (sinusoid) = \( \frac{A}{\sqrt{2}} \)
Node Voltage Method

We want to express the KCL in terms of node voltages using Ohm’s Law. How do we do this?

1. Pick a ground node that touches as many sources as possible.
2. Label the nodes that touch ground through a voltage source.
3. Pick a node where you need to find the node voltage. Write KCL at that node.
4. Express each current using Ohm’s Law and the node voltages. Be careful of your current directions. The voltage goes “where you start” minus “where you end”.
5. Solve! (May need a system of equations if there is more than one unknown node)
Diodes

- Diodes are non-linear devices that allow current to pass in only one direction
- Offset-Ideal Model
- How do we know if a diode is on? Guess and Check!
- If we guess off, we dictate that the current is zero
- Guess on, positive current flows and $V_{on}$ volts are across diode
- If our guess is wrong, one of these conditions will be violated
  - E.g. We guess on, but reverse current flows through the diode
- Clipper circuits
Concise Advice to Make Your Grade Look Nice

• Use your note sheet more like a study tool

• Do not spend too much time on questions you cannot answer

• Spend your time showing what you know

• Look at past exams

• Take time to relax before your exam