HKN ECE 110 Review Session Exam 1

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• Electrons carry charge and thus convey electrical energy
  • Units: Coulombs [C]

• Current is the flow of charge
  • Units: Coulombs/second = Amps [A] (Amperes)

• Voltage is the work done per unit charge. Think of this as the force or pressure on the electrons
  • Units: Joules/ Coulomb = Volts [V]

• Resistance is the opposition to the flow of charge
  • Units: Ohms [Ω]
Energy vs. Power

• Energy is the ability to do work
  • Units: Joules [J]

• Energy can take on many forms
  • Potential Energy – Chemical, Electrical, Mechanical
  • Kinetic Energy

• Energy is always conserved!

• Power is the rate at which energy is transferred
  • Units: Joules/second = Watts [W]
A capacitor is a device that stores charge

Units: Coulombs/Volt = Farads [F]

This charge is said to be “coupled”

\[ E_{\text{capacitor}} = \frac{1}{2} CV^2 \]

\[ C = \frac{Q}{V} \]
Ohm’s Law, Resistance, and Power

- Ohm’s Law describes the relationship between the voltage across and current through a resistive element
  - Ohm’s law only applies for linear components, i.e. resistors
  - More on linear components with Thevenin/Norton Equivalents (and in ECE 210!)
- \[ V = IR \]
- Resistance of an element can be found by: \[ R = \frac{\rho l}{A} \]
- Power dissipated by an element can be found by: \[ P = IV, P = I^2R, P = \frac{V^2}{R} \]
  - You can go between the three forms using Ohm’s Law!
Nodes, KVL, and KCL

- A node is any part of a circuit that is at an *equipotential*
  - Wires are equipotentials

- Kirchhoff’s Voltage Law
  - Conservation of Energy
  - Performed on a loop
  - $\sum V_{\text{rises}} = \sum V_{\text{drops}}$

- Kirchhoff’s Current Law
  - Conservation of Charge
  - Performed at a node
  - Bubble method
  - $\sum I_{\text{in}} = \sum I_{\text{out}}$
Legit Tips and Tricks to Show Off Your Wits

• Use your note sheet more like a study tool
• Study past exams
• Do not spend too much time on questions you cannot answer
• Review past exams
• Spend your time showing what you know
• Look at past exams