

## Test #1 Overview

### Material covered

- Chapters 1 - 3 (omit section 3.5) in Electric Circuits, 8<sup>th</sup> Edition by Nilsson
- Homework Assignments 1-3

### Format

- Problems will mainly be similar to class examples, textbook examples, and homework problems
- A small part (typically 15% or less) of the test might be multiple choice, fill-in-the blank, true/false, etc.
- Number of problems: This varies, but 6-8 might be typical. Some problems may have multiple parts.
- There is generally some time-pressure on the tests. Practice enough problems so that you can work them quickly or you will probably run short on time. Work the easiest problems first.

### Chapter 1 Topics (30 – 40%)

Definitions and relationships for charge, current, voltage, power, and energy:

$$i(t) = \frac{dq(t)}{dt}$$

$$q(t) = \int_0^t i(t)dt + q(0)$$

$$v(t) = \frac{dW}{dq}$$

$$p(t) = \frac{dW}{dt} = v \bullet i$$

$$w(t) = \int_0^t p(t)dt + w(0)$$

Problems might involve functions, graphs, or other information.

Correct units must be used. Also be familiar with SI prefixes.

The use of *passive sign convention* and *active sign convention* for calculating power absorbed or power delivered.

Calculating energy costs.

### Chapter 2-3 Topics (60 – 70%)

Resistance

- Physical properties
- Ohm's Law
- Passive sign convention
- Power calculations
- Conductance

$$R = \frac{\rho \cdot l}{A}$$

Voltage sources and Current sources

- Independent sources
- Dependent sources
- Combinations of sources

Kirchhoff's Voltage Law (KVL) – including sign convention

Kirchhoff's Current Law (KCL) – including sign convention

Series and Parallel elements

- Analysis of resistive circuits
- Series resistance
- Parallel resistance – general form and special form for 2 resistors
- Series/parallel combinations
- Equivalent resistance
- Voltage division
- Current division – general form and special form for two resistors in parallel

Power calculations in circuits ( $P_{\text{delivered}} = P_{\text{absorbed}}$ )

Balanced bridge circuit (when  $R_1 \cdot R_4 = R_2 \cdot R_3$  the bridge is balanced and the current through  $R_5 = 0$ )  
(See labeling of resistors in class notes or in the text.)

Y- $\Delta$  and  $\Delta$ -Y Conversions – Equations and diagrams shown below will be provided.

### Y- $\Delta$ Conversion Equations:

$$R_a = \frac{R_1 \cdot R_2 + R_2 \cdot R_3 + R_3 \cdot R_1}{R_1}$$

$$R_b = \frac{R_1 \cdot R_2 + R_2 \cdot R_3 + R_3 \cdot R_1}{R_2}$$

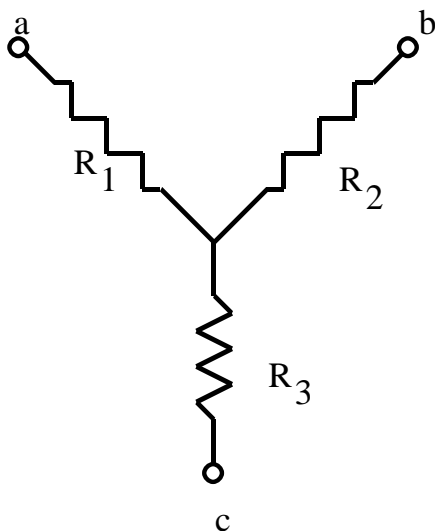
$$R_c = \frac{R_1 \cdot R_2 + R_2 \cdot R_3 + R_3 \cdot R_1}{R_3}$$

### $\Delta$ -Y Conversion Equations:

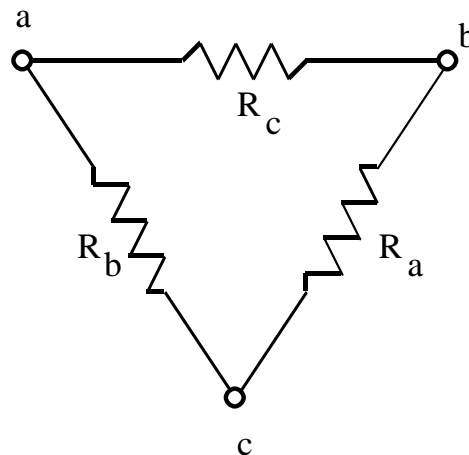
$$R_1 = \frac{R_b \cdot R_c}{R_a + R_b + R_c}$$

$$R_2 = \frac{R_c \cdot R_a}{R_a + R_b + R_c}$$

$$R_3 = \frac{R_a \cdot R_b}{R_a + R_b + R_c}$$



Wye Circuit



Delta Circuit