EECE 202 NETWORK ANALYSIS I **Dr. Charles J. Kim**

Note08: Summary

1. A resistor (R) is a passive element in which the voltage V across it is directly proportional to the current I through it. By Ohm's law: V=IR

2. A branch is a single two-terminal element.

3. A node is the point of connection between two or more branches.

4. A loop is a closed path in a circuit.

5. KCL states that the currents at any node algebraically sum to zero. In other words, the sum of the currents entering a node equals the sum of currents leaving the node.

6. KVL states that the voltages around a closed path algebraically sum to zero. In other words, the sum of voltage rises equals the sum of voltage drops.

7. Two elements are in series when they are connected sequentially, end to end.

8. Two elements are in parallel when they are connected to the same two nodes.

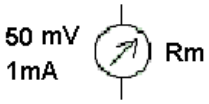
9. When two resistors are in series, their equivalent resistance is: $R_{eq} = R_1 + R_2$

10. When two resistors are in parallel, their equivalent resistance is: $R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$ (Note: this applies only when there are TWO resistors)

11. The voltage division principle for two resistors in series: $v_1 = v\frac{R_1}{R_1 + R_2}$ and $v_2 = v\frac{R_2}{R_1 + R_2}$

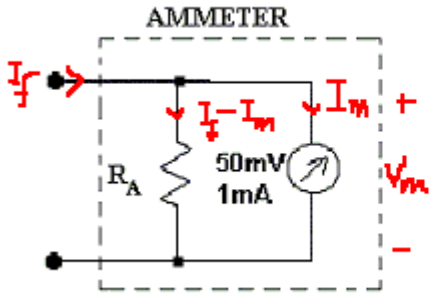
12. The current division principle for two resistors in parallel: $i_1 = i\frac{R_2}{R_1 + R_2}$ and $i_2 = i\frac{R_1}{R_1 + R_2}$

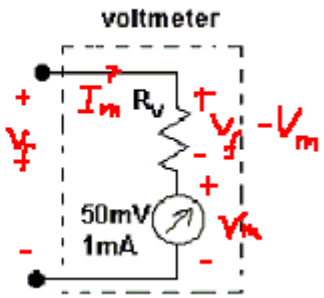
13. d'Arsonval Movement has rated current (through) I_m, and rated voltage (across), V_m, hence, the movement has an internal resistance, R_m: $R_m = \frac{V_m}{I_m}$.



The needle of the movement deflects to the fullest when the rated current flows through. This means, as example, when a current of half the rated current flows, the needle then would indicate the middle of the scale.

14. The full scale of a meter (using the meter movement), V_f for voltmeter and I_f for ammeter, can be changed by inserting a shunt resistor R_A for an Ammeter and a series resistor R_V for a Voltmeter.





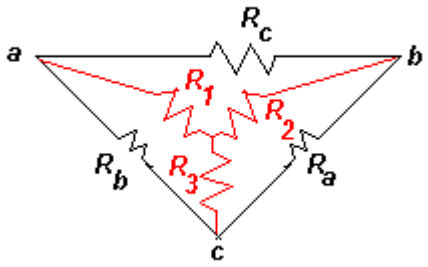
$$R_A = \frac{V_m}{I_f - I_m} \qquad R_V = \frac{V_f - V_m}{I_m}$$

15. The formula for a delta-to-wye transformation are: "Two flanks over sum"

$$R_1 = \frac{R_b R_c}{R_a + R_b + R_c} \qquad R_2 = \frac{R_a R_c}{R_a + R_b + R_c} \qquad R_3 = \frac{R_b R_a}{R_a + R_b + R_c}$$

16. The formula for a Y-to-delta transformation are:

$$R_a = \frac{R_1 R_2 + R_2 R_3 + R_3 R_1}{R_1} \quad R_b = \frac{R_1 R_2 + R_2 R_3 + R_3 R_1}{R_2} \quad R_c = \frac{R_1 R_2 + R_2 R_3 + R_3 R_1}{R_3}$$



17. The Wheatstone Bridge is a resistance measurement tool with the following relationship: $R_1 R_x = R_2 R_3$ when there is no current flowing from the node made by R_1 and R_3 to the node made by R_2 and R_x.