Contents

1 Lecture #2

1.1 Basic circuit laws (cont.)

Example on Ohm's law:

A voltage supply of 100V supplies 500W to 4 elements, 10, 12 and 2 in ohm. Find the power absorbed by the 4th element.

$$I_t = \frac{P}{V} = 5A$$

$$P_1 = 5^2 \times 10 = 250W$$

$$P_2 = 3^2 \times 12 = 108W$$

$$P_3 = 2^2 \times 2 = 8W$$

$$\therefore P_4 = P - (P_1 + P_2 + P_3) = 500 - 366 = 134W$$

1.1.1 Kirchhoff's Law

1. 1. KVL (Kirchhoff's voltage law)

   In any loop inside a circuit, The sum of voltage across the loop equals zero.

$$\Sigma V_{loop} = 0$$

   - Series connection

     Elements are in series connection only if the same current passes through all of them. Therefore the equivelant resistance of n resistors in series equals:

$$R_{eq} = \Sigma_{n=1} R_n$$

- Voltage division

$$V = V_t \times \frac{R_1}{R_t}$$

  - When in a series connection, The value of the voltage is directly proportional with the value of the resistance

2. 2. KCL (Kirchhoff's current law)

- Junction

  A junction is a connection point in the circuit between only two elements and the current passing through is constant.

- Node:

  A node is a connection point in the circuit that connects at least three branches and is where the current is branched.

KCL states that the sum of currents going into a node equals the sum of currents going out of the same node

$$\Sigma I_{in} = \Sigma I_{out}$$

- Parallel connection

  Parallel connection is where elements share the same start and end point and therefore share the same voltage

$$\frac{1}{R_{eq}} = \Sigma_{n=1} \frac{1}{R_n}$$

  - In the case of only two resistors:

$$R_{eq} = \frac{R_1 \times R_2}{R_1 + R_2}$$

- Current division

$$\frac{I_1}{I_2} = \frac{R_2}{R_1}$$

$$I_1 = I_t \times \frac{R_2}{R_1 + R_2}$$

  - When in parallel connection, the value of the current is inversly proportional with the value of the resistance.

1.1.2 Conductance (G)

$$G = \frac{1}{R} = \omega = S$$