EES - Electrical & Electronics System

29/01/2025 - Lecture 1

Basic information about EES

30/01/2025 - Lecture 2

1) Electric circuit

- Interconnection of simple electrical devices with at least one closed path in which current may flow.
- An electric circuit is a mathematical model that approximates the behaviour of an actual electrical system.
- Consists of various elements
  - Resistor
  - Inductor
  - Capacitor
  - Voltage

- Circuit elements
  - 2 terminal components that cannot be sub-divided
  - Described mathematically in terms of its terminal voltage

- Basic circuit elements
  - Active Elements
    - Dependent Sources (*not in syllabus*)
    - Independent Sources
      - Voltage Sources
        - Ideal DC Voltage Source
        - Practical DC Voltage Source
      - Current Sources
        - Ideal DC Current Source
        - Practical DC Current Source
  - Passive Elements
    - Resistors
    - Inductors
    - Capacitors

2) Ohm's Law

To apply Ohm's law me must pay careful attention to the direction of current, the direction of current *i* and voltage *v* must conform with passive sign convention
If current is flowing from lower polarity to higher polarity then *v = -ir*

- Value of R, R can range from 0 -> infinity
  - An element with R = 0 is called a short circuit, v = ir = 0

- If R is infinity then it is called an open circuit
  - For an open circuit, i = v/r = 0
  - Voltage may be having some value but current will be zero
- Not all resistors obey Ohm's law, the resistors which obey ohm's law are known as Linear Resistor

3) Sources

- Ideal Nature
  - Ideal voltage source maintains a prescribed voltage regardless of current in device, Internal Resistance = 0
  - An ideal current source maintains prescribed current regardless of the voltage

4) Source transformation

- Conversion of practical voltage source to the Current Source and vice versa
  - Voltage & Current sources shown in figure are electrically equivalent

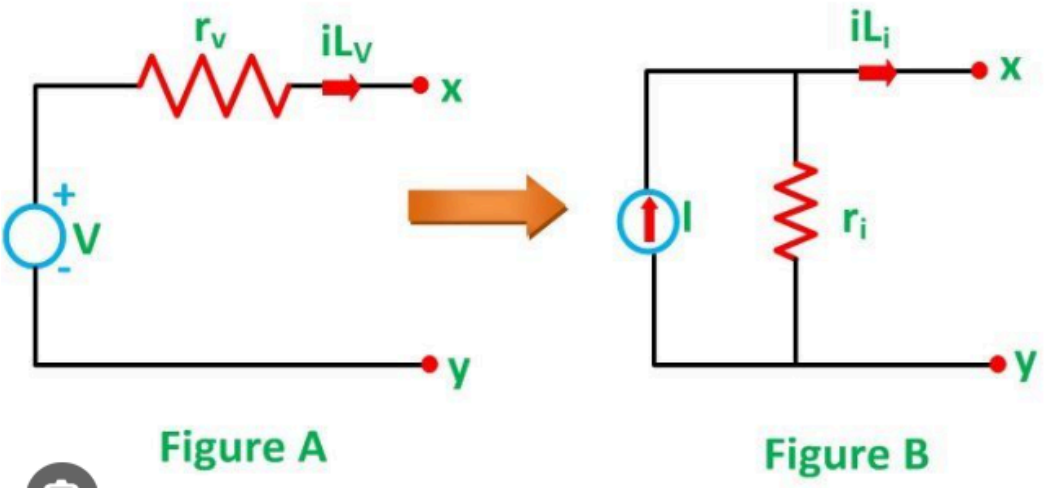

Figure A Figure B