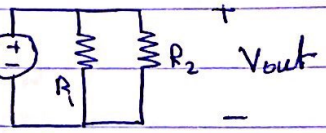
Exp 1: Network Theorems

- **Proportionality :-**

The response in a circuit is proportional to the Soura acting in the circuit (linearity)

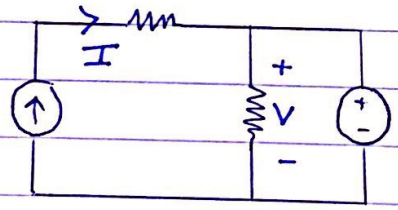
$V_{out} = kV_{in}$ (k: constant)



- **Superposition :-**

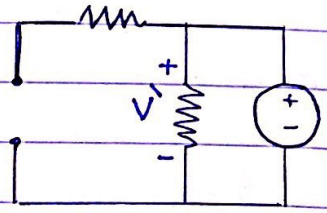
Responses are calculated individualy by Killing Sources.

Current Sources —Turns to→ open Circuit
Voltage Sources ——→ short Circuit

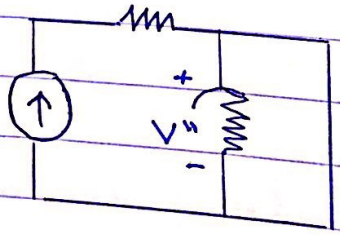


To find V:-

①



②



$V = V' + V''$

• Thevenin's Theorem

Replacing a circuit with an equivalent Voltage Source (V_{TH}) and an equivalent Resistor (R_{TH})

There are three cases for R_{Th} and V_{Th}

1- Circuit Containes only independant Sources

$V_{Th} = V_{o.c}$

Voltage Sources ⟶ Short circuit

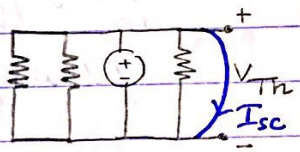
Current " ⟶ open circuit

2- " " independant and dependant Sources.

$V_{Th} = V_{o.c}$

R_{Th}: There are two ways:-

find I_{sc} and $R_{Th} = \frac{V_{Th}}{I_{sc}}$



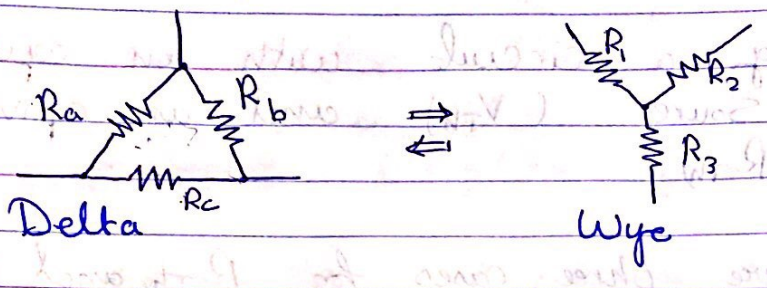
or $R_{Th} = V_T / I_T$ with killing independant Sources as in 1

V_T, I_T are assumed ↳ one of them are assumed and you find the other on

3- " " only dependant Sources

$V_{Th} = 0$ and $R_{Th} = \frac{V_T}{I_T}$

- Delta to Wye Equivalent Circuits



$$R_a = R_1R_2 + R_2R_3 + R_3R_1 \;/\; R_2$$
$$R_b = R_1R_2 + R_2R_3 + R_3R_1 \;/\; R_1$$
$$R_c = R_1R_2 + R_2R_3 + R_3R_1 \;/\; R_3$$

$$R_1 = R_aR_c \;/\; R_a + R_b + R_c$$
$$R_2 = R_bR_c \;/\; R_a + R_b + R_c$$
$$R_3 = R_aR_b \;/\; R_a + R_b + R_c$$

- Reciprocity Theorem

If you replaced two Sources (current and Voltage) in the circuit, the amount of circuit and voltage flowing in the circuit stays the same.