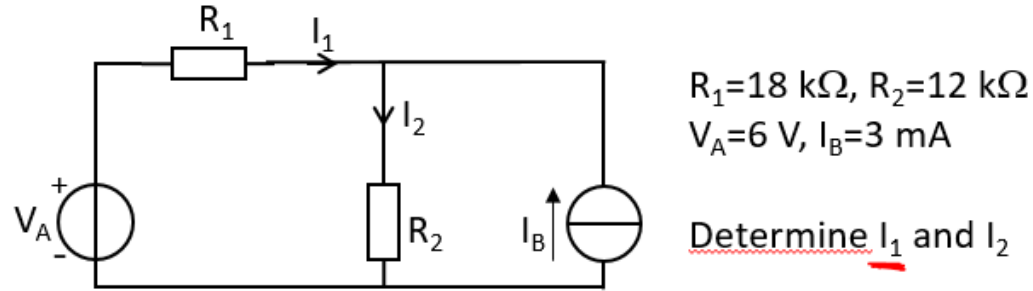


Superposition

- A linear system obeys the superposition principle
- An electrical circuit with voltage/current sources, resistors (R), capacitors (C) and inductors (L) is a linear system
- The voltages/currents in the circuit is the sum of the individual contributions from each source in the circuit



① Contribution from V_A (Set $I_B = 0$) \Rightarrow

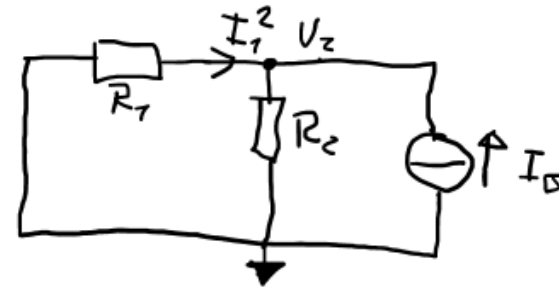
$$\Rightarrow I_1' = \frac{V_A}{R_1 + R_2}$$

② Contribution from I_B (Set $V_A = 0$) \Rightarrow

$$\frac{0 - V_2}{R_1} + I_B = \frac{V_2 - 0}{R_2} \Rightarrow I_B = \left[\frac{1}{R_1} + \frac{1}{R_2} \right] V_2$$

$$\Rightarrow V_2 = \frac{I_B}{\frac{1}{R_1} + \frac{1}{R_2}} = \frac{R_1 R_2}{R_1 + R_2} I_B$$

$$I_1^2 = \frac{0 - V_2}{R_1} = -\frac{R_2}{R_1 + R_2} I_B$$



$$I_1 = I_1' + I_1^2 = \frac{V_A}{R_1 + R_2} - \frac{R_2}{R_1 + R_2} I_B = \frac{6}{18 + 12} - \frac{12}{18 + 12} 3 = \frac{6 - 36}{30} = -1 \text{ mA}$$

$$I_2 = I_1 + I_B = -1 + 3 = 2 \text{ mA}$$