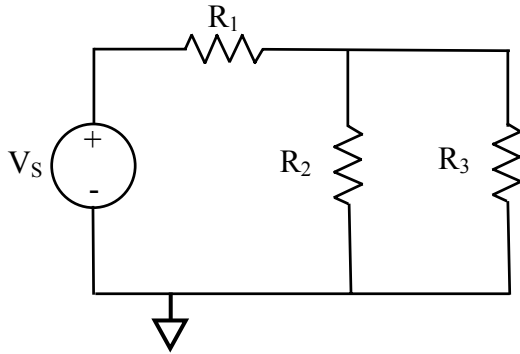


Note: Use Node analysis to solve all problems. For this set of problems, use the ground node as the reference. Make sure to indicate the current direction and polarity in your answers.

**Problem 1**

Given:

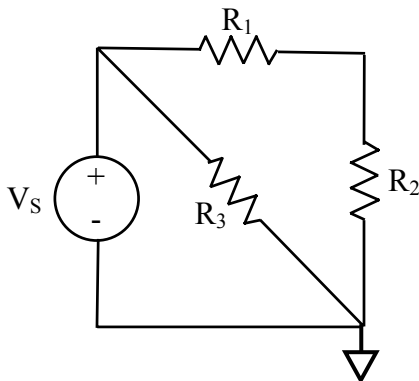
$$V_s = 30 \text{ V}$$

$$R_1 = 500 \, \Omega \quad R_2 = 500 \, \Omega$$

$$R_3 = 500 \, \Omega$$

Find:

1. All node voltages.
2. The voltage across each resistor
3. The current through each resistor
4. The current through the voltage source.

**Problem 2**

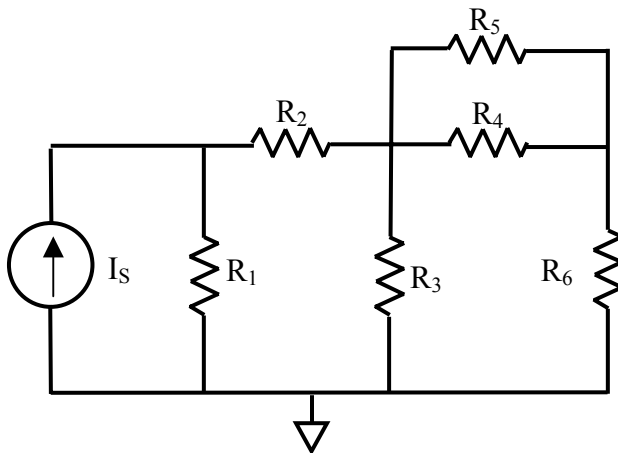
Given:

$$V_s = 30 \text{ V}, R_1 = 100 \, \Omega,$$

$$R_2 = 200 \, \Omega, R_3 = 300 \, \Omega$$

Find:

1. All node voltages.
2. The voltage across each resistor
3. The current through each resistor
4. The current through the voltage source.

**Problem 3**

Given:

$$R_1 = 20 \, \Omega, \quad R_2 = 10 \, \Omega$$

$$R_3 = R_4 = R_5 = 20 \, \Omega$$

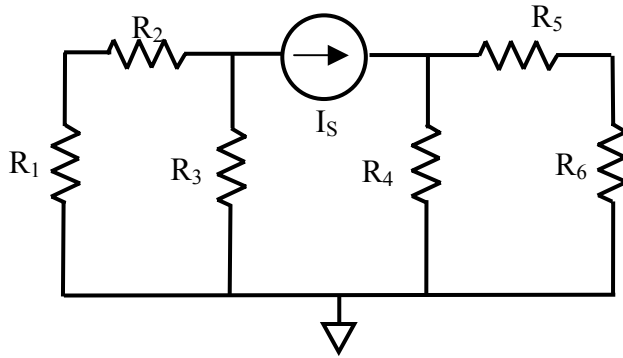
$$R_6 = 30 \, \Omega$$

$$I_s = 5 \text{ A}$$

Find:

- All node voltages.
- The current through  $R_3$  and  $R_4$ .
- The voltage across  $R_5$ .
- The voltage across the source.

**Problem 4**



Given:

$$R_1 = 15 \, \Omega, R_2 = 15 \, \Omega$$

$$R_3 = 30 \, \Omega, R_4 = 40 \, \Omega$$

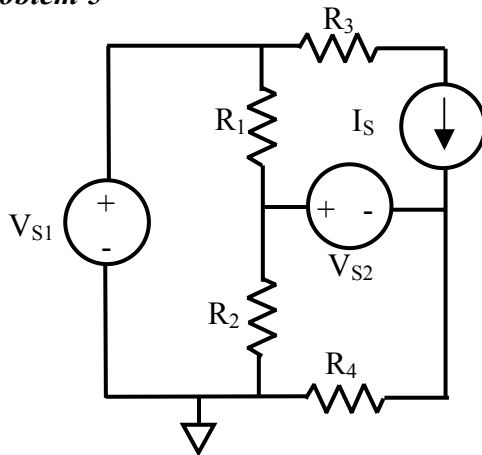
$$R_5 = 20 \, \Omega, R_6 = 20 \, \Omega$$

$$I_S = 100 \text{ mA}$$

Find using Nodal Analysis:

- All the node voltages.
- $i_{R2}, i_{R4}, V_{R5}, V_{R3}, I_S$
- The voltage across the current source.

**Problem 5**



Given:

$$R_1 = R_2 = 10 \, \text{k}\Omega,$$

$$R_3 = 2 \, \text{k}\Omega, R_4 = 1 \, \text{k}\Omega,$$

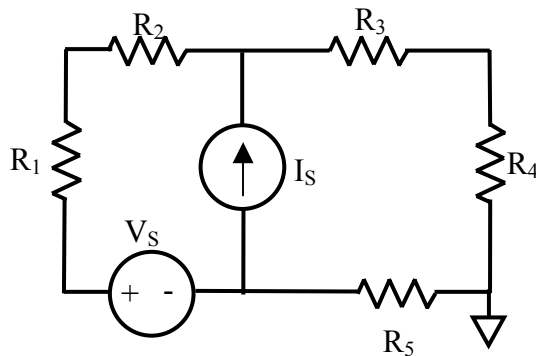
$$V_{S1} = 12 \, \text{V}, V_{S2} = 0.5 \, \text{V}$$

$$I_S = 2.5 \, \text{mA}$$

Find using Nodal Analysis:

- All the node voltages.
- $i_{R1}, i_{R4}, V_{R3}, V_{R2}$
- The current through the voltage sources.
- The voltage across the current source.

**Problem 6**



Given:

$$V_s = 12 \, \text{V}, I_S = 5 \, \text{mA}$$

$$R_1 = 300 \, \Omega, R_2 = 500 \, \Omega$$

$$R_3 = 60 \, \Omega, R_4 = 240 \, \Omega$$

$$R_5 = 180 \, \Omega$$

Find:

- All the node voltages.
- $i_{R2}, i_{R3}, V_{R1}, V_{R4}$
- The current through the voltage source.
- The voltage across the current source.