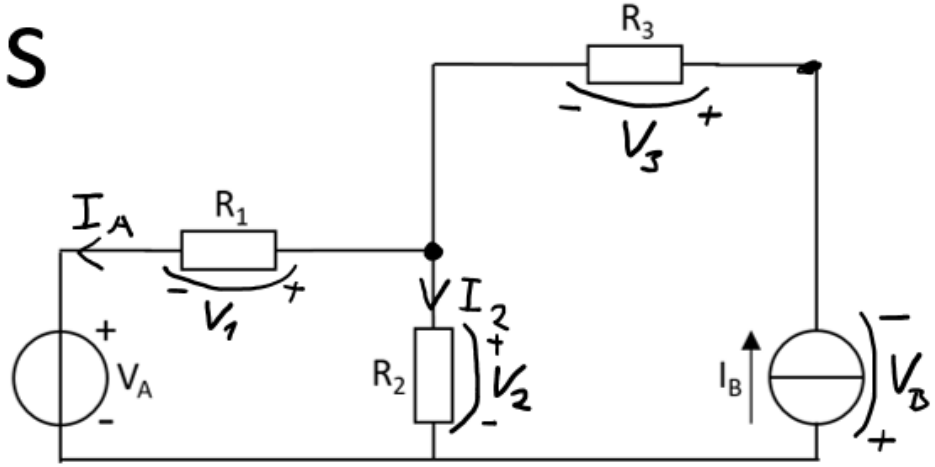
Analyzing Electrical Circuits



$R_1 = R_3 = 1\ k\Omega$, $R_2 = 2\ k\Omega$, $V_A = 1\ V$, $I_B = 2\ mA$

$$I_B = \frac{V_1}{R_1} + \frac{V_2}{R_2} \quad (1)$$

$$V_2 + V_3 + V_B = 0 \quad (2)$$

$$V_A + V_1 - V_2 = 0 \quad (3)$$

$$V_3 = R_3 \cdot I_B \quad (4) \Rightarrow V_3 = 1 \cdot 2 = 2V$$

$$(3) \text{ in } (1) \Rightarrow I_B = \frac{V_2 - V_A}{R_1} + \frac{V_2}{R_2} \Rightarrow R_1 R_2 \cdot I_B = R_2 V_2 - R_2 V_A + R_1 V_2$$

$$\Rightarrow V_2 = \frac{R_1 R_2 \cdot I_B + R_2 V_A}{R_2 + R_1} = \frac{1 \cdot 2 \cdot 2 + 2 \cdot 1}{2+1} = \frac{6}{3} = 2V \Rightarrow I_2 = \frac{V_2}{R_2} = \frac{2}{2} = 1\ mA$$

$$V_1 = V_2 - V_A = 2 - 1 = 1V \quad I_A = \frac{V_1}{R_1} = \frac{1}{1} = 1\ mA$$

$$V_B = -V_2 - V_3 = -2 - 2 = -4V$$

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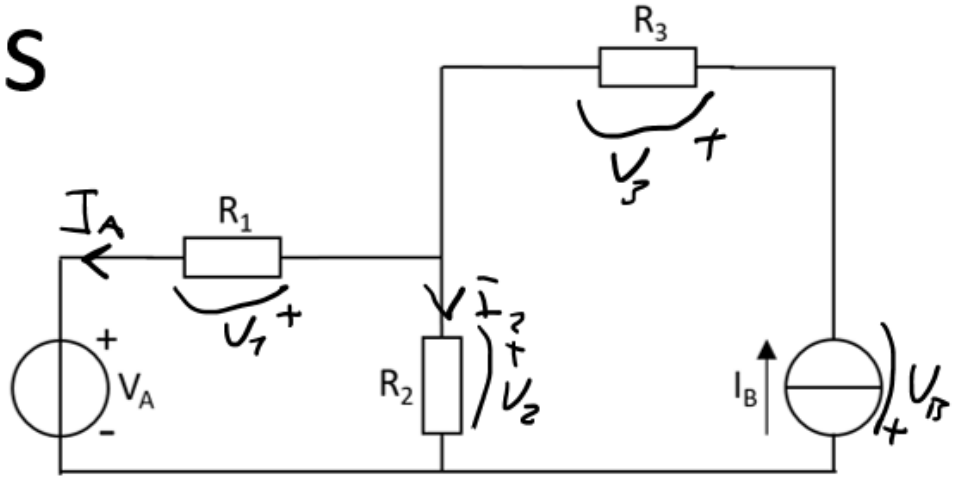
$V_B = -4V$ $I_A = 1mA$ $I_2 = 1mA$ $V_1 = 1V$

$V_2 = 2V$ $V_3 = 2V$

Circuit Element	V [V]	I [mA]	P [mW]
V_A	1	1	1
I_B	−4	2	−8
R_1	1	1	1
R_2	2	1	2
R_3	2	2	4



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