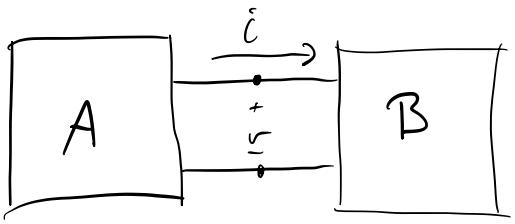
Midtsemester test

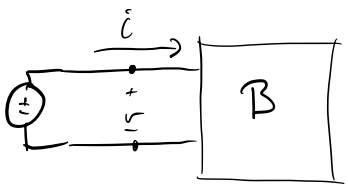
(1)



$i = 20\,mA$

$r = -5$

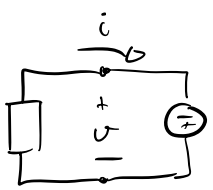
For at $i > 0$ må



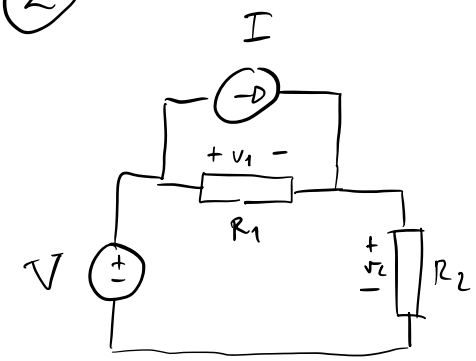
men da er $v > 0$, så

derfor må kretsen se

slik ut:



(2)



$V = 5\ V$

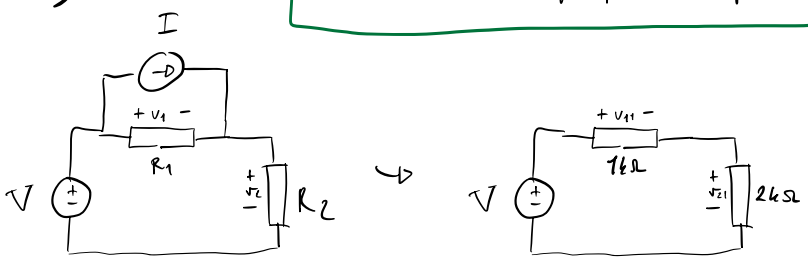
$I = 1\ mA$

$R_1 = 1\ k\Omega$

$R_2 = 2\ k\Omega$

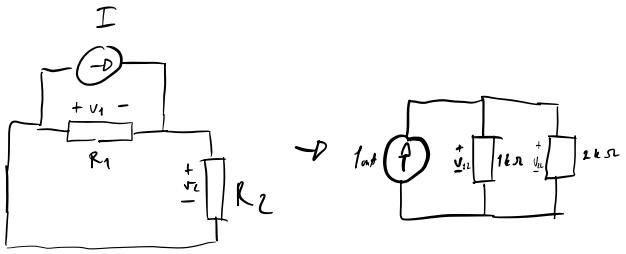
a)

Vi bruke superposisjonsprinsippet



$V_{11} = 5V \cdot \frac{1k\Omega}{1+2k\Omega} = \frac{5}{3}V$

$V_{21} = 5V \cdot \frac{2k\Omega}{1+2k\Omega} = \frac{10}{3}V$



$i_{12} = 1mA \cdot \frac{2k\Omega}{1+2k\Omega} = \frac{2}{3}mA \rightarrow V_{12} = \frac{2}{3}mA \cdot 1k\Omega = \frac{2}{3}V$

$i_{22} = 1mA \cdot \frac{1k\Omega}{1+2} = \frac{1}{3}mA \rightarrow V_{22} = \frac{1}{3}mA \cdot 2k\Omega = \frac{2}{3}V$

Da blir spenningen

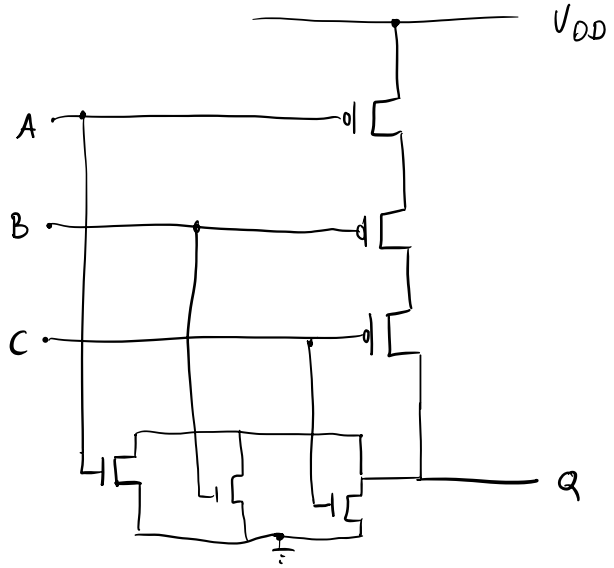
$V_1 = V_{11} + V_{12} = \frac{5}{3}V + \frac{2}{3}V = \frac{7}{3}V$

$V_2 = V_{21} + V_{22} = \frac{10}{3}V + \frac{2}{3}V = \frac{12}{3}V = 4V$

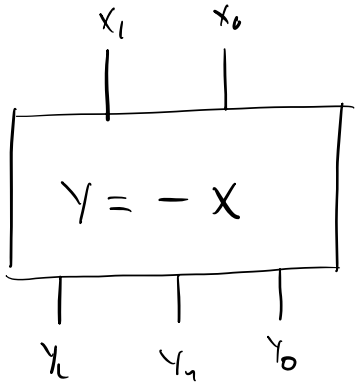
b) Effekt er $P = \frac{E}{T}$ som betyr at motstandene vil motta effekt fra spennings- og strømkilden som da leverer Energi, og Energi per tid, til kretsen.

③

A	B	C	Q
0	0	0	1
0	0	1	0
0	1	0	0
1	0	0	0
0	1	1	0
1	0	1	0
1	1	0	0
1	1	1	0



(4)



a)

x_0	x_1	Y_2	Y_1	Y_0
0	0	0	0	0
0	1	1	1	1
1	0	1	1	0
1	1	1	0	1

$Y = -X$

b)

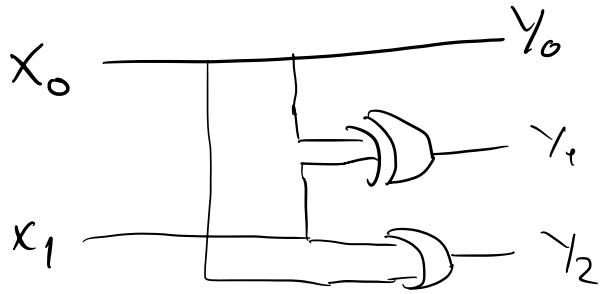
$$Y_0 = \bar{x}_0 x_1 + x_0 x_1$$

$$= x_1(\bar{x}_0 + x_0) = x_1$$

$$Y_1 = x_1 \bar{x}_0 + x_0 \bar{x}_1$$

$$Y_2 = \overline{\overline{Y_2}} = \overline{\overline{x_0}\,\overline{x_1}} = \overline{\overline{x_0 + x_1}} = x_0 + x_1$$

c)



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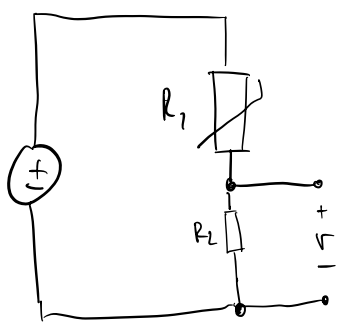
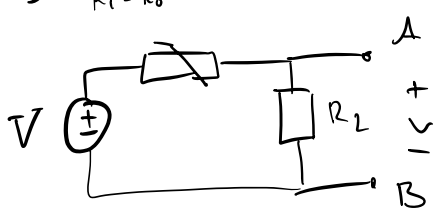


$$R_1 = R_0 - aT$$

a) $R_1 = R_0 - aT$



$$V = V_{R_2} = V \cdot \frac{R_2}{R_1 + R_2}$$

$$= V \cdot \frac{R_2}{R_2 + R_0 - aT} //$$

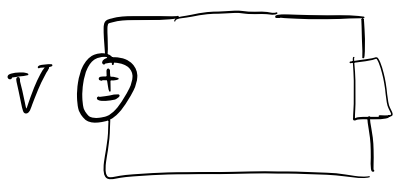
b) Dessom $\lim_{T \to \infty}$ vil V gå mot $\frac{R_2}{\infty}$ altså mot 0

Dessom $\lim_{T \to 0}$ vil V gå mot $\frac{R_2}{R_0 + R_2}$

Dvfor vil V øke når T blir mindre og synke når T blir større

c) $V = 9V$, $R_2 = 10k\Omega$, $R_0 = 20k\Omega$ og $a = 400\Omega/C^\circ$

$$R_2 = R_0 - aT = 20k\Omega - 0.4k\Omega/C^\circ \cdot 25C^\circ = 10k\Omega$$



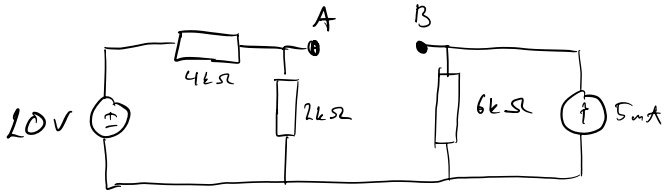
$$R_1 \parallel R_2 = \frac{R_1 R_2}{R_1 + R_2} = \frac{10 \cdot 10}{10+10} k\Omega = 5k\Omega$$

$$U = RI \Rightarrow I = \frac{U}{R} = \frac{9V}{5k\Omega} = 1.8mA$$

$$h = \frac{0.5Ah}{1.8 \cdot 10^{-3}A} \approx 278h$$

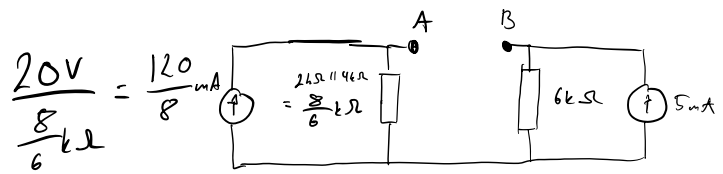
Batteriet vil vare i 278 timer

(7)



⇓

$\frac{20V}{\frac{8}{6}k\Omega} = \frac{120}{8}mA = 15mA$



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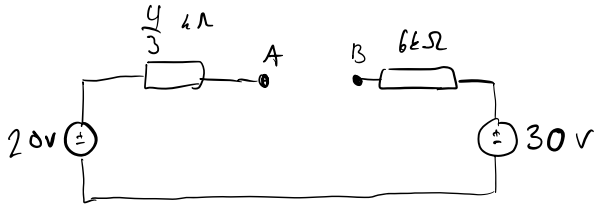
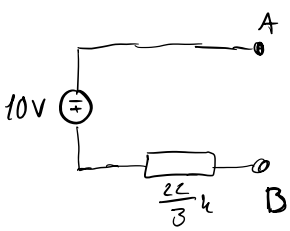


$R_{Tol} = \frac{4}{3}k\Omega + 6k\Omega = \frac{22}{3}k\Omega$

$V_{Tol} = 20V - 30V = -10V$

⇓



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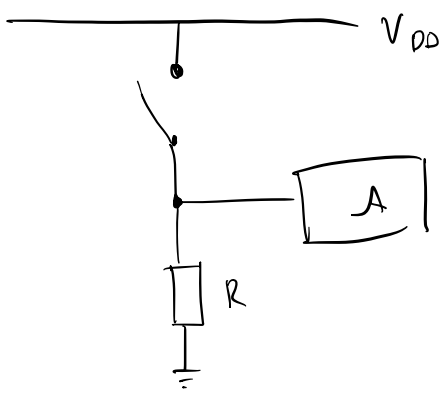

a) $R = 0$ kan potensielt kortslutte elementer i A. Kommer an på hva det er i A. Fordelen er bare at man slipper en motstand

b) $R = \infty$ er det samme som å koble av jord og da blir $I = \frac{V}{\infty} \approx 0$

Dersom det er ønskelig å ha strøm i A er dette en dårlig ide.

c) $R = 1\,\Omega$ betyr at $I = \frac{V}{1\,\Omega}$ og dermed får du fort mye strøm gjennom motstanden og vil bli ekstremt varm.

d) $R = 1k\,\Omega$ betyr at vi får koblet til jord og vil oppleve normale verdier i nedtrekksmotstanden.