① a) $P = U \cdot I = U \cdot \frac{U}{R} = \frac{U^2}{R}$

$R = \frac{U^2}{P} = \frac{(400V)^2}{0,8} = 500\Omega$

b) $P = \frac{(12V)^2}{500} = 0,288\ W$

c) $P = I^2 \cdot R \Rightarrow I = \sqrt{\frac{P}{R}} = \sqrt{\frac{0,2}{500}} = 24,5 \cdot 10^{-3}$

$R_{tot} = \frac{230V}{24,3 \cdot 10^{-3}} = 9383\ \Omega$

$R_{lys} = 20 \cdot 500\Omega = 10000\Omega$ Vi ser at motstanden i lysene er mot

d) Da må den gi et spenningsfall på $12 - 10 = 2V$

Strømmen over parallell blir da $I_4 = \frac{10V}{500\Omega} = 20mA$ $I_{tot} = 20mA \cdot 20 = 400mA$

$R_{mot} = \frac{2V}{400mA} = 5\Omega$

e) $I = \sqrt{\frac{P}{R}} = \sqrt{\frac{0,2}{500\Omega}} = 20mA$

$R_{tot} = \frac{230V}{20 \cdot 10^{-3}A} = 11500\Omega$

$R_{ledning} = 11500\Omega - 10000\Omega = 1500\Omega$

Lengde $= \frac{1500\Omega}{0,1} = 15\ km$ med kabel

$\frac{15\ km}{2} = 7,5\ km$ inn i skogen

f)

$i(0) = \frac{12V}{40\Omega} = 300mA$

$\tau = \frac{L}{R}$

$R_{Tot} = \frac{500}{20} = 25$

$P = I^2 R$

$I = \sqrt{\frac{P}{R}} = \sqrt{\frac{0,2}{50\Omega}} = 44$

brenner minst

$i(\infty) = 0$

$i(t) = 24e^{-\frac{25}{L}t}\ mA$

$24e^{-\frac{25}{L}} = 20$

$L = -\frac{25}{\ln(\frac{4}{5})} = 4$

② a)

T_2	T_1	T_0	N_6	N_5	N_4	N_3	N_2	N_1
0	0	0	0	0	1	1	1	1
0	0	1	0	1	1	1	1	1
0	1	0	1	0	0	1	1	1
0	1	1	0	1	0	1	1	0
1	0	0	0	1	0	1	1	1
1	0	1	0	0	0	0	1	1

b) $N_1 = \overline{T_2 T_1 T_0} = \overline{T_2} + \overline{T_1} + \overline{T_0}$

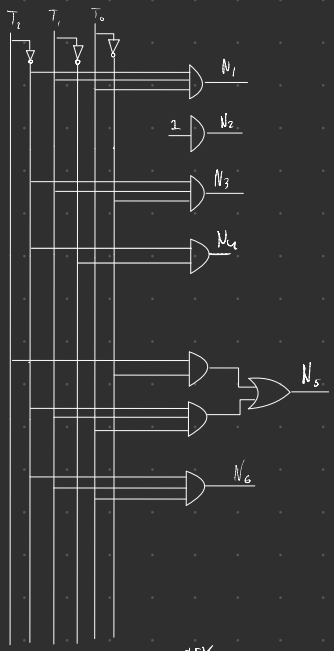
$N_2 = \overline{T_2 T_1 T_0}$ $N_3 = \overline{T_2} + \overline{T_1} + \overline{T_0}$

$N_4 = \overline{T_2}\,\overline{T_1}\,\overline{T_0} + \overline{T_2}\,\overline{T_1}\,T_0 = \overline{T_2}\,\overline{T_1}$

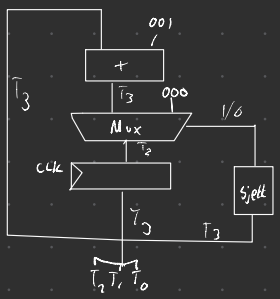
$N_5 = \overline{T_2}\,T_1\,\overline{T_0} + \overline{T_2}\,T_1\,T_0 + T_2\,\overline{T_1}\,\overline{T_0} = \overline{T_2}\,\overline{T_0} + \overline{T_2}\,T_1\,T_0$

$N_6 = \overline{T_2}\,T_1\,T_0$

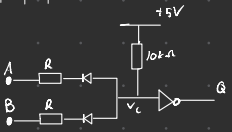
② c)



d)

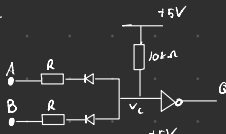


③ a)



R = 1 kΩ

A = 0
B = 0



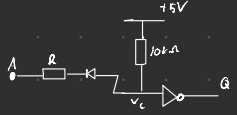
$R_{ges} = 10k\Omega + \frac{R}{2}$

$I = \frac{V}{(10k\Omega + \frac{R}{2})}$

$V_c = V_R = \frac{\frac{R}{2} \cdot V}{(10k\Omega + \frac{R}{2})}$

$V_c = \frac{1k\Omega \cdot 5V}{(10k\Omega + \frac{1}{2}kA)} = 0{,}48\ V$

A = 1
B = 0

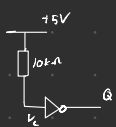


$R_{ges} = 10k\Omega + R$

$I = \frac{V}{10k\Omega + R}$

$V_c = \frac{R \cdot V}{(10k\Omega + R)}$

$V_c = \frac{1k\Omega \cdot 5V}{(10k\Omega + 1k\Omega)} = 0{,}45V$



$U = V_c = 5\ V$

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

Nand gate

b) $R = 15\ k\Omega$

A = 0
B = 0 $\Rightarrow$ $V_c = V_R = \frac{R_2 \cdot V}{(10k\Omega + \frac{R}{2})}$

$V_c = \frac{7{,}5k\Omega \cdot 5V}{(10k\Omega + 7{,}5k\Omega)} = 2{,}14\ V$

A = 1
B = 0 $\Leftrightarrow$ A = 0, B = 1 $\quad V_c = \frac{R \cdot V}{(10k\Omega + R)} = \frac{15k\Omega \cdot 5V}{(10k\Omega + 15k\Omega)} = 3V$

A = 1
B = 1 $\Rightarrow$ 5V

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

Nor gate

(4) a)

$i = C\dot{v}$

$I_1 = \frac{v_1}{R_1} + C\dot{v}$

$I_2 = \frac{v_0}{R_2}$

$I_1 + I_2 = 0$

$\frac{v_1}{R_1} + C\dot{v} + \frac{V_0}{R_2} = 0$

$V_0 = -R_2\left(\frac{v_1}{R_1} + C\frac{dv_2}{dt}\right)$