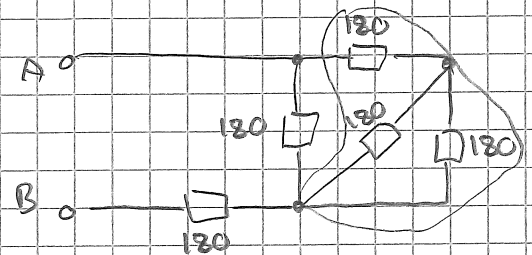
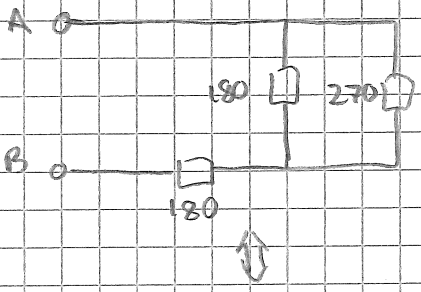
Lösning Dugga Elektriska kretsar 2015-10-23

1. [Ω]



$180 + 180 // 180 = 270\ \Omega$



$180 + 180 // 270 = 288\ \Omega$

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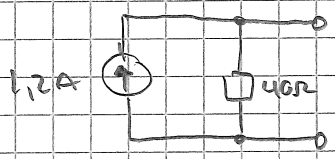
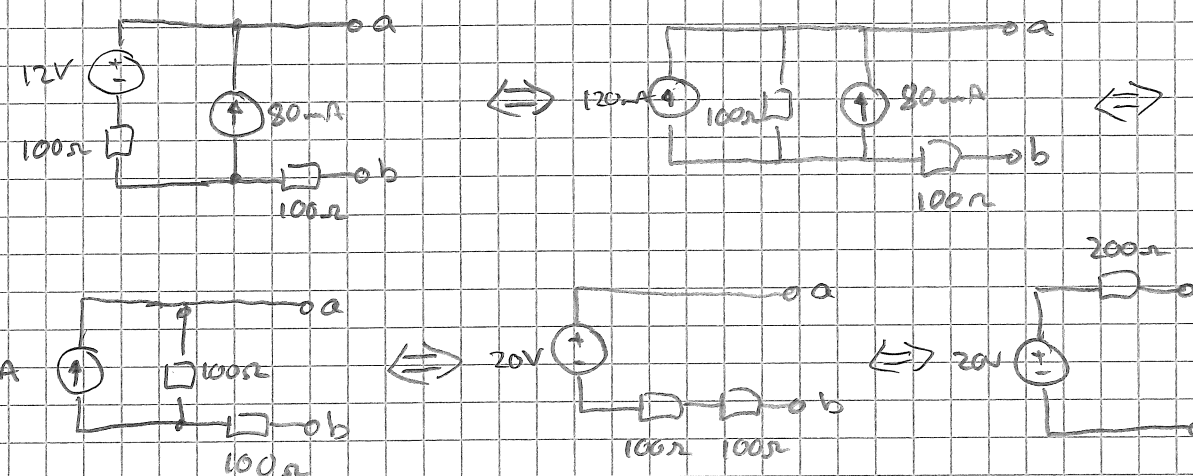
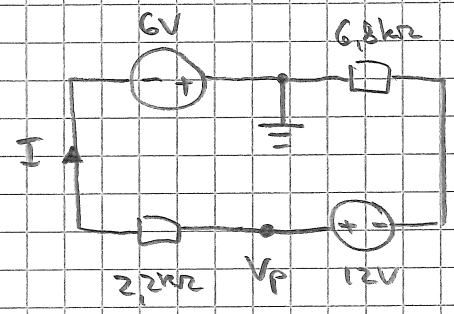
2. Ur figur $\begin{cases} U_T = 48V \\ I_k = 1{,}2A \end{cases} \Rightarrow \begin{cases} J = I_k = 1{,}2A \\ R_0 = \frac{U_T}{I_k} = \frac{48}{1{,}2} = 40\ \Omega \end{cases}$



3.



4.

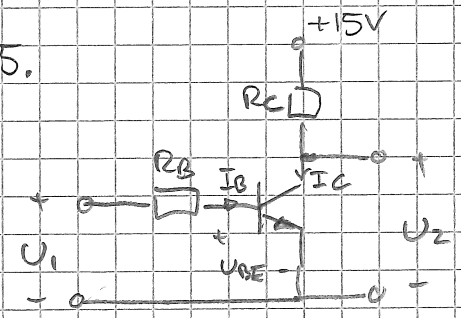


KU $-6V + 2{,}2k\Omega \cdot I - 12V + 6{,}8k\Omega \cdot I = 0 \Rightarrow$

$$I = \frac{6V+12V}{2{,}2k\Omega + 6{,}8k\Omega} = 2mA$$

$$V_P = -6V + 2{,}2k\Omega \cdot I = -6 + 2200 \cdot 2 \cdot 10^{-3} = -1{,}6V$$

5.



$h_{FE} = 120$ $R_B = 100k\Omega$

$U_{CE_{sat}} = 0{,}1V$

a) $U_1 = 5V$ $R_C = 820\Omega$

KU baskrets $U_1 - R_B \cdot I_B - U_{BE} = 0 \Rightarrow I_B = \frac{U_1 - U_{BE}}{R_B} = \frac{5-0{,}7}{100000} = 43\mu A$

$I_C = h_{FE} \cdot I_B = 120 \cdot 43\mu A = 5{,}16\,mA$

KU kollektorkr. $U_2 + R_C I_C - 15V = 0 \Rightarrow U_2 = 15V - R_C I_C = 15 - 820 \cdot 5{,}16 \cdot 10^{-3} = 10{,}8V$

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b) $U_1 = 2V$ $U_2 = U_{CE_{sat}} = 0{,}1V$

KU baskrets $\Rightarrow I_B = \frac{U_1 - U_{BE}}{R_B} = \frac{2-0{,}7}{100000} = 13\mu A$

$I_C = h_{FE} \cdot I_B = 120 \cdot 13\mu A = 1{,}56\,mA$

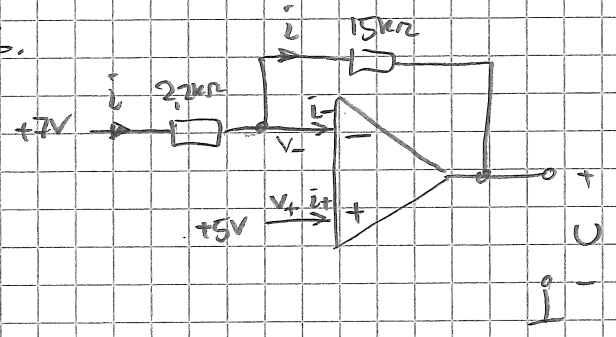
KU kollektorkr. $U_2 + R_C I_C - 15V = 0 \Rightarrow$

$$R_C = \frac{15V - U_2}{I_C} = \frac{15 - 0{,}1}{1{,}56 \cdot 10^{-3}} = 9551\,\Omega$$

Detta är gränsfallet för bottning.

Transistorn bottnar för $R_C \geq 9551\,\Omega$

6.



Ideal OP $\Rightarrow i_+ = i_- = 0$

-"- negativt återkopplad $\Rightarrow V_- = V_+$

Från figur $V_+ = +5V \Rightarrow V_- = 5V$

$$i = \frac{7V - V_-}{2200\Omega} = \frac{7-5}{2200} = 0{,}909\ mA$$

$$U = V_- - 15k\Omega \cdot i = 5 - 15000 \cdot 0{,}909 \cdot 10^{-3} = \underline{-8{,}6\ V}$$