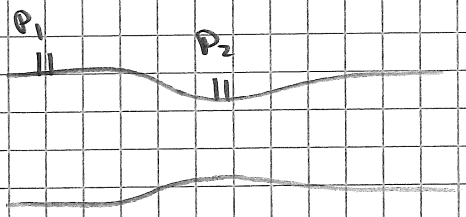
Tentamen Givare o Don LEU029 2017-08-17

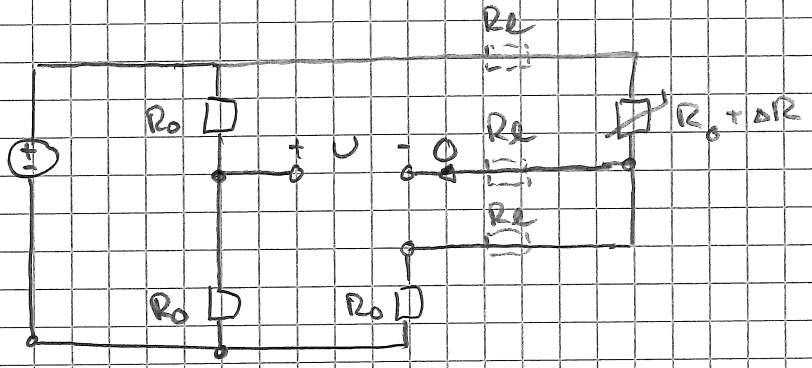
G1] a) Strömbanor i halvledare böjs av p g a magnetfält så att en spänning bildas

c)



Genom att mäta tryck P_1 o P_2 kan volymflödet bestämmas. Venturirör används för att mäta volymflöde.

b)



R_L hamnar både i översta och understa grenen ⇒ Påverkar ej U

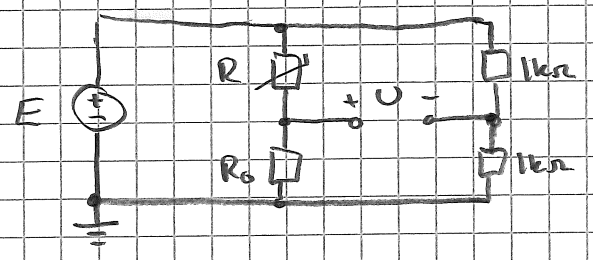
Ingen ström i mellersta R_L ⇒ Påverkar ej U

Slutsats Ledningsresistans påverkar ej mätning av U såsom vid 2-trådsmätning

d] Kapacitiv kopplade störningar

2017-08-17

G2]



$E = 3{,}0\,V$

$R_0 = 100\,\Omega$

$R = R_0 + \Delta R$

$U = 74{,}0\,mV$

Om ΔR positiv $\Rightarrow$ U negativ $\Rightarrow$

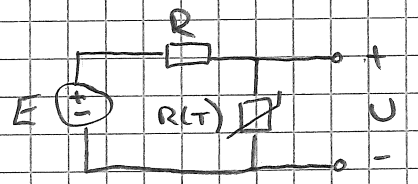
FS $U = \overset{(+)}{(-)} \frac{\Delta R}{4R_0 + 2\Delta R} \cdot E \Rightarrow \frac{E}{U} \cdot \Delta R + 2\Delta R = -4R_0 \Rightarrow$

$$\Delta R = \frac{-4R_0}{\frac{E}{U} + 2} = \frac{-4 \cdot 100}{\frac{3{,}0}{74 \cdot 10^{-3}} + 2} = -9{,}403\ \Omega$$

Pt-100 $R = R_0(1 + \alpha T) = 100 + 0{,}385 \cdot T = R_0 + \Delta R$ $\Rightarrow$

$0{,}385 \cdot T = -9{,}403 \Rightarrow T = \frac{-9{,}403}{0{,}385} = \underline{\underline{-24{,}4\ °C}}$

G3]



$E = 4\,V$ $R = 1{,}5\,k\Omega$

$U = 1{,}2\,V$ $R_{25} = 1{,}0\,k\Omega$ $B = 3528\,K$

$$U = \frac{R(T)}{R + R(T)} \cdot E \Rightarrow \frac{E}{U} = \frac{R + R(T)}{R(T)} = 1 + \frac{R}{R(T)} \Rightarrow$$

$$R(T) = \frac{R}{\frac{E}{U} - 1} = \frac{1500}{\frac{4}{1{,}2} - 1} = 642{,}86\,\Omega$$

FS $R(T) = R_{25}\, e^{B\left(\frac{1}{T} - \frac{1}{298}\right)} \Rightarrow$

$$\frac{1}{T} = \frac{1}{B} \ln \frac{R(T)}{R_{25}} + \frac{1}{298} = \frac{1}{3528} \ln \frac{642{,}86}{1000} + \frac{1}{298} = 0{,}0032305$$

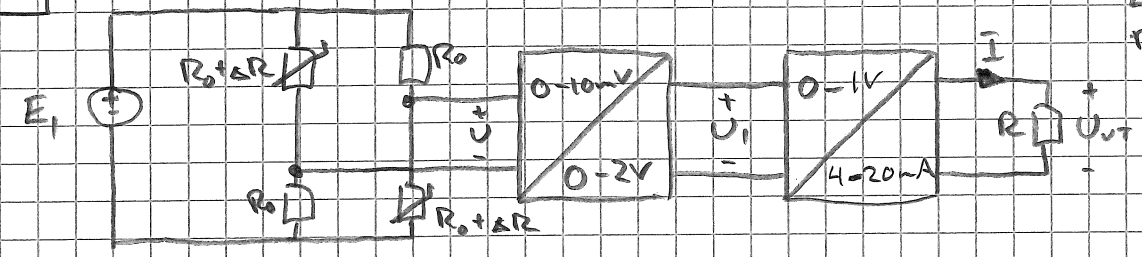
$$\underline{\underline{T = 309{,}6\ K}}$$

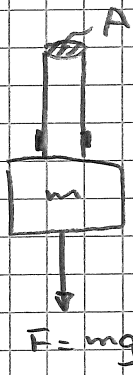
2017-08-17

G4

$E_1 = 15V$

$R = 100\Omega$





$$\left.\begin{array}{l} F = mg \\ F = \sigma A \\ \sigma = E \cdot \varepsilon \end{array}\right\} \Rightarrow \varepsilon = \frac{\sigma}{E} = \frac{F}{EA} = \frac{mg}{EA} =$$

$$= \frac{500 \cdot 9{,}81}{200 \cdot 10^9 \cdot \pi \left(\frac{20 \cdot 10^{-3}}{2}\right)^2} = 7{,}807 \cdot 10^{-5}$$

$$r = \frac{\Delta R}{R_0} = k_f \cdot \varepsilon$$

Halvbrygga

Ex $U \approx \frac{1}{2} \frac{\Delta R}{R_0} \cdot E_1 = \frac{1}{2} k_f \varepsilon E_1 = \frac{1}{2} \cdot 2{,}09 \cdot 7{,}807 \cdot 10^{-5} \cdot 15 = 1{,}224\ mV$

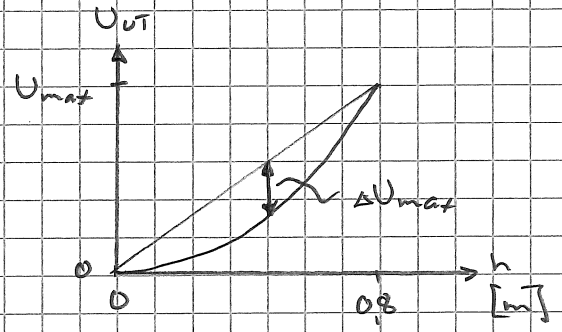
$$A_v = \frac{U_1}{U} = \frac{2}{0{,}01} = 200$$

$$U_1 = 200 \cdot U = 0{,}2447\ V$$

$$I = 4mA + \frac{16mA}{1V} \cdot U_1 = 4mA + \frac{16mA}{1V} \cdot 0{,}2447V = 7{,}9152\ mA$$

$$\underline{U_{VT}} = R \cdot I = 100 \cdot 7{,}9152 \cdot 10^{-3} = \underline{0{,}79\ V}$$

G5]



$U_{max} = 40\ mV$

$\Delta U_{max} = 9{,}4\ mV$

Ur figur

$$\text{Linjäritetsavvikelse} = \frac{\Delta U_{max}}{U_{max}} = \frac{9{,}4}{40} = 0{,}235 = 23{,}5\ \%$$

G6] a] $U_T = E_{AB}(T_2, 0°) - E_{AB}(T_1, 0°) =$

$= E_{AB}(86°, 0°) - E_{AB}(50°, 0°) =$ /Ur Tabell/

$= 3{,}631\ mV - 2{,}036\ mV = 1{,}595\ mV$

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b) $R_1 = \frac{\alpha E R_0}{k} = \frac{3{,}85 \cdot 10^{-3} \cdot 12 \cdot 100}{42{,}5 \cdot 10^{-6}} = 108{,}7\ k\Omega$

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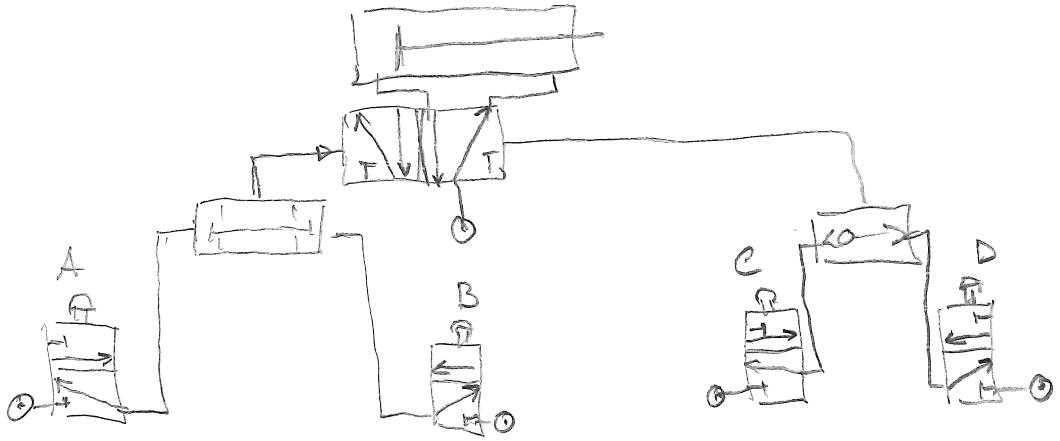
c] $U = k \cdot T_2 = 42{,}5 \cdot 10^{-6} \cdot 86 = 3{,}66\ mV$

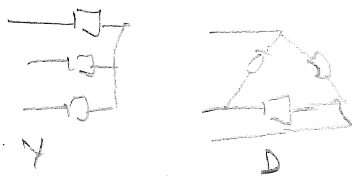
D1



D2 a) Vilka kontakter kontaktor K1 har

b) Kontaktor K3:s kontakt 13 14 hittas i position 1E

D3



$P_Y = 3 \cdot \frac{U^2}{R} = 3 \cdot \frac{230^2}{33} = 4810\,W \qquad P_D = 3 \cdot P_Y = 14490\,W$

D4 $P_1 = \sqrt{3}\, U_n \cdot I_1 \cdot \cos\varphi \Rightarrow I_1 = \frac{73 \cdot 10^3}{\sqrt{3}\,400 \cdot 1} = 105\,A$

Last 2 $S_2 = \sqrt{3} \cdot U_n \cdot I_2 = \sqrt{3}\,400 \cdot 82 = 56{,}8\,kVA$

$P_2 = \sqrt{S_2^2 - Q_2^2} = \sqrt{56{,}8^2 - 45^2} = 34{,}7\,kW$

$I_L = \frac{S}{\sqrt{3}\,U_n} = \frac{\sqrt{(34{,}7 + 73)^2 + 45^2}}{\sqrt{3}\,400} \cdot 10^3 = 168\,A$

Kond $Q = \sqrt{3}\, U_n I_3 \sin\varphi_c \Rightarrow I_3 \frac{38 \cdot 10^3}{\sqrt{3} \cdot 400 \cdot 1} = 54{,}8\,A$

Sammanlagt $\Sigma P = 73 + 34{,}7 = 107{,}7\,kW$

$\Sigma Q = 45 - 38 = 7\,kVAr$

$I_L = \frac{S}{\sqrt{3}\,U_n} = \frac{\sqrt{107{,}7^2 + 7^2}}{\sqrt{3}\,400} \cdot 10^3 = 155{,}7 \approx \underline{\underline{156\,A}}$

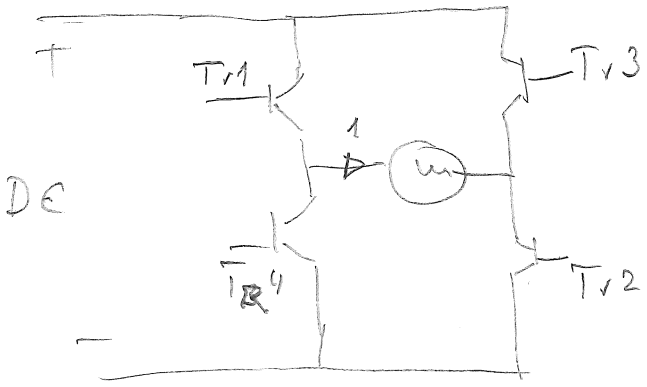
D5

$P_{axel} = \omega \cdot M = 2\pi \cdot \frac{1860}{60} \cdot 3{,}2 = 623\,W \qquad P_{el} = U \cdot I = 24 \cdot 31 = 744\,W$

$\eta = \frac{P_{axel}}{P_{el}} \approx 84\,\%$ b) $I_{Start} = \frac{U}{R_L} = \frac{24}{0{,}13} = 185\,A \qquad K_T = \frac{3{,}2}{31}\,\frac{Nm}{A}$

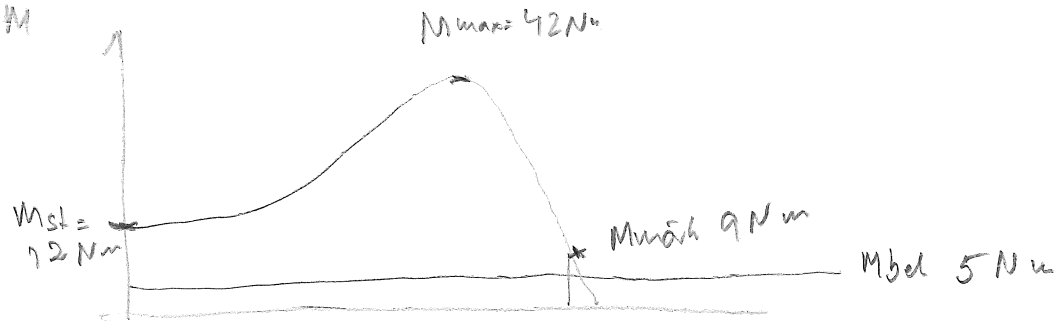
$M_{st} = \frac{3{,}2}{31} \cdot 185 = 19{,}1 \approx 19\,Nm$

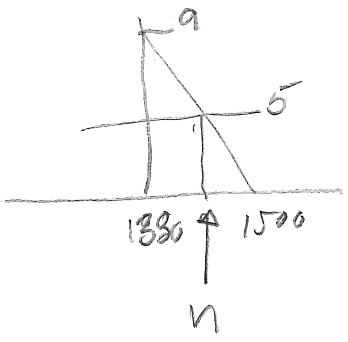
D6



Tr1 o Tr2 leder Tr3 o Tr4 spärra vrid åt ett håll
Tr1 o Tr2 spärra Tr3 o Tr4 leda — " — andra hållet
Pulsbreddsmodulering ger olika hastighet

D7





Liktormiga trianglar $\frac{a}{5} = \frac{1380-1500}{n-1500}$ $n = 1433$ rpm