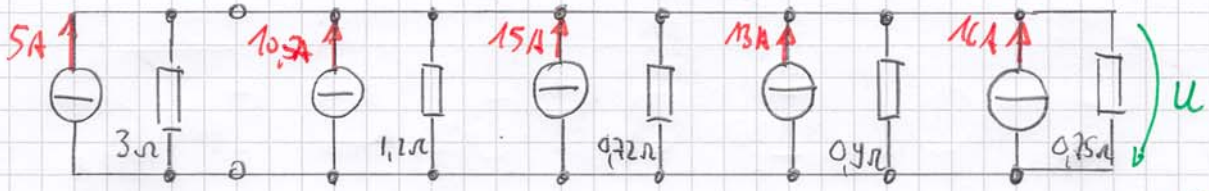
GET A - 2

1. Aufgabe

Knotenpotentialverfahren

(4)

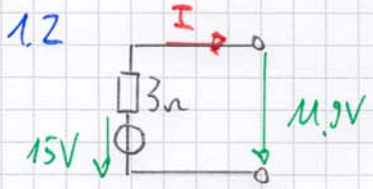


1.1. $U \cdot \left(\frac{1}{3\Omega} + \frac{1}{1{,}2\Omega} + \frac{1}{0{,}72\Omega} + \frac{1}{0{,}9\Omega} + \frac{1}{0{,}75\Omega} \right) = (5A + 10{,}5A + 15A + 13A + 16A)$ (4)

$= 0$

$$U = \frac{59{,}5A}{55} = 11{,}9V$$

1.2



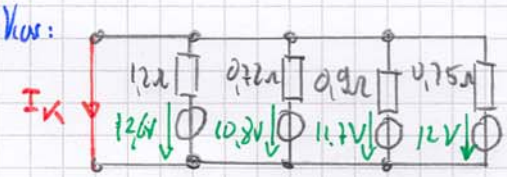
$$-15V + I \cdot 3\Omega + 11{,}9V = 0$$

$$I = \frac{3{,}1V}{3\Omega} = 1{,}033A$$ (4)

1.3 $U_0 > 11{,}1V \Rightarrow$ Entladung, d.h. die Akkus mit der Leerlaufspannung 12,6V und 12V werden entladen! (4)

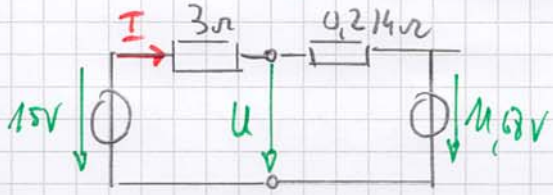
Zusatz: Ersatzspannungsquelle:

- für Akkus:



$$I_K = \frac{12{,}6V}{1{,}2\Omega} + \frac{10{,}8V}{0{,}72\Omega} + \frac{11{,}7V}{0{,}9\Omega} + \frac{12V}{0{,}75\Omega}$$

$I_K = 54A$ $\quad R_i = 0{,}24\Omega$

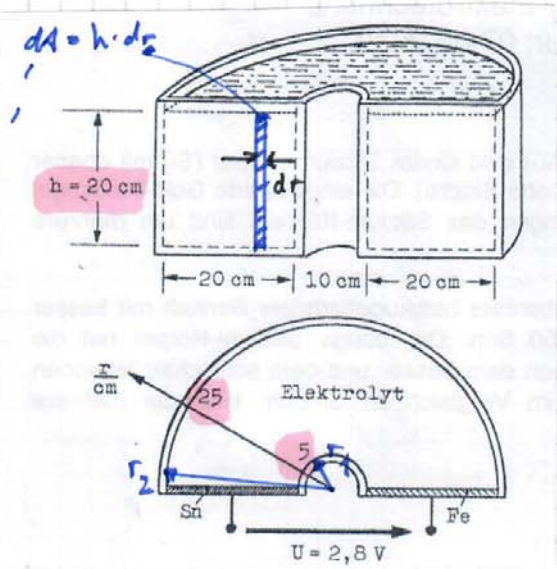


$$I = \frac{15V - 11{,}68V}{3\Omega + 0{,}24\Omega} = 1{,}033A$$

$U_0 = R_i \cdot I_1 = 11{,}68V$

2. Aufgabe

$U \rightarrow E \Rightarrow j \rightarrow I$



„halber" Ring:

2.1 (6P.)

$U = \int E \cdot ds = E \cdot \pi r$

$\Rightarrow E = \frac{U}{\pi \cdot r}$ (2)

$\frac{E}{V/m} = \frac{1}{V/m} \cdot \frac{2{,}8\,V}{\pi \cdot cm} \cdot \frac{1}{r/cm}$ (2)

$cm \rightarrow 0{,}01\,m$

$\frac{E}{V/m} = 89{,}1 \cdot \frac{1}{r/cm}$ (2)

2.2 (8P.)

$j = \kappa \cdot E$ (1)

$I = \int j \cdot dA = h \cdot \kappa \cdot \int_{r_1}^{r_2} E \cdot dr$ (2)

$I = 0{,}2\,m \cdot 2{,}44\,\frac{S}{m} \cdot \int_{5\,cm}^{25\,cm} 89{,}1\,\frac{V}{m} \cdot \frac{1}{r} \cdot cm \cdot dr$ (3)

$I = \frac{0{,}2\,m \cdot 2{,}445 \cdot 89{,}1\,V \cdot 0{,}01\,m}{m} \cdot \ln\frac{25}{5} = 0{,}700\,A = I$ (2)

2.3 (4P.)

$\frac{dP}{dV} = j \cdot E = \kappa \cdot E^2 \Rightarrow \frac{dP}{dV} \sim \frac{1}{r^2}$

2.4

$F = \frac{E(r_1)^2}{E(r_2)^2} = 25$ (2)

$\Rightarrow$ Maximum für $r = 5\,cm$ (2): $\left(\frac{dP}{dV}\right)_{r=r_1} = 775\,\frac{W}{m^3}$; $E(r_1) = 17{,}82\,\frac{V}{m}$

Minimum für $r = 25\,cm$ (2): $\left(\frac{dP}{dV}\right)_{r=r_2} = 31\,\frac{W}{m^3}$; $E(r_2) = 3{,}56\,\frac{V}{m}$