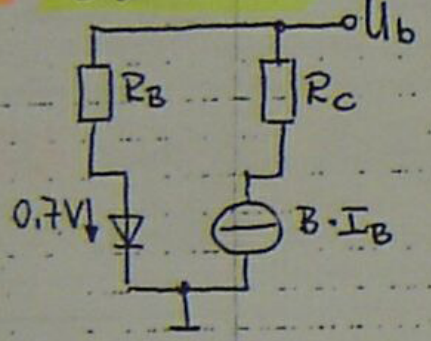
Lösung der Testklausur WS 2004/2005

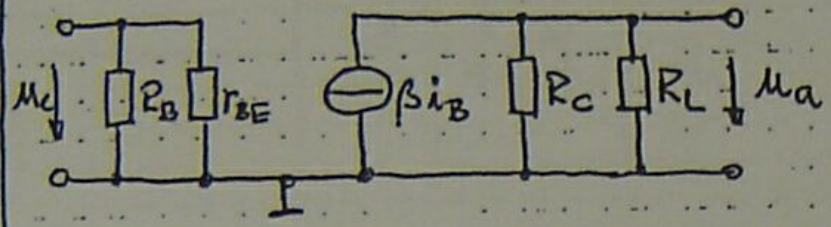
Aufgabe 1

1.1 Emitterschaltung

1.2 G, GEB



1.3 K, WEB



1.4

$$R_B \geq \frac{U_b - 0{,}7V}{I_{B\,max}} = \frac{23{,}3V}{20\mu A} = 1{,}165M\Omega \xRightarrow[E24]{} R_B = 1{,}2M\Omega$$

$$I_B = \frac{U_b - 0{,}7V}{R_B} = 19{,}4\mu A$$

1.5

$$I_{C,A} = B \cdot I_B = 400 \cdot 19{,}4\mu A = 7{,}76mA$$

$$S = \frac{I_{C,A}}{U_T} = \frac{7{,}76mA}{26mV} = 298mS$$

$$R_C = \frac{U_b - U_{CE}}{I_{C,A}} = \frac{12V}{7{,}76mA} = 1{,}546k\Omega \xrightarrow[E24]{} \begin{cases} 1{,}5k\Omega \\ 1{,}6k\Omega \end{cases}$$

$$U_{CE,A} = U_B - R_C \cdot I_C = \begin{cases} 24V - 11{,}64V = 12{,}36V \\ 24V - 12{,}41V = 11{,}59V \end{cases}$$

1.6

$$r_e = R_B \parallel r_{BE} \approx r_{BE} = \frac{\beta}{S} = \frac{400}{298mS} = 1{,}34k\Omega$$

$$A = -S(R_C \parallel R_L) = -298mS \cdot 750\Omega = -223{,}5$$

Aufgabe 2:

2.1 $r_e \to \infty$, $r_a \to 0$, $A \to \infty$, $I_{e\,offset} = 0$, $U_{e\,offset} = 0$

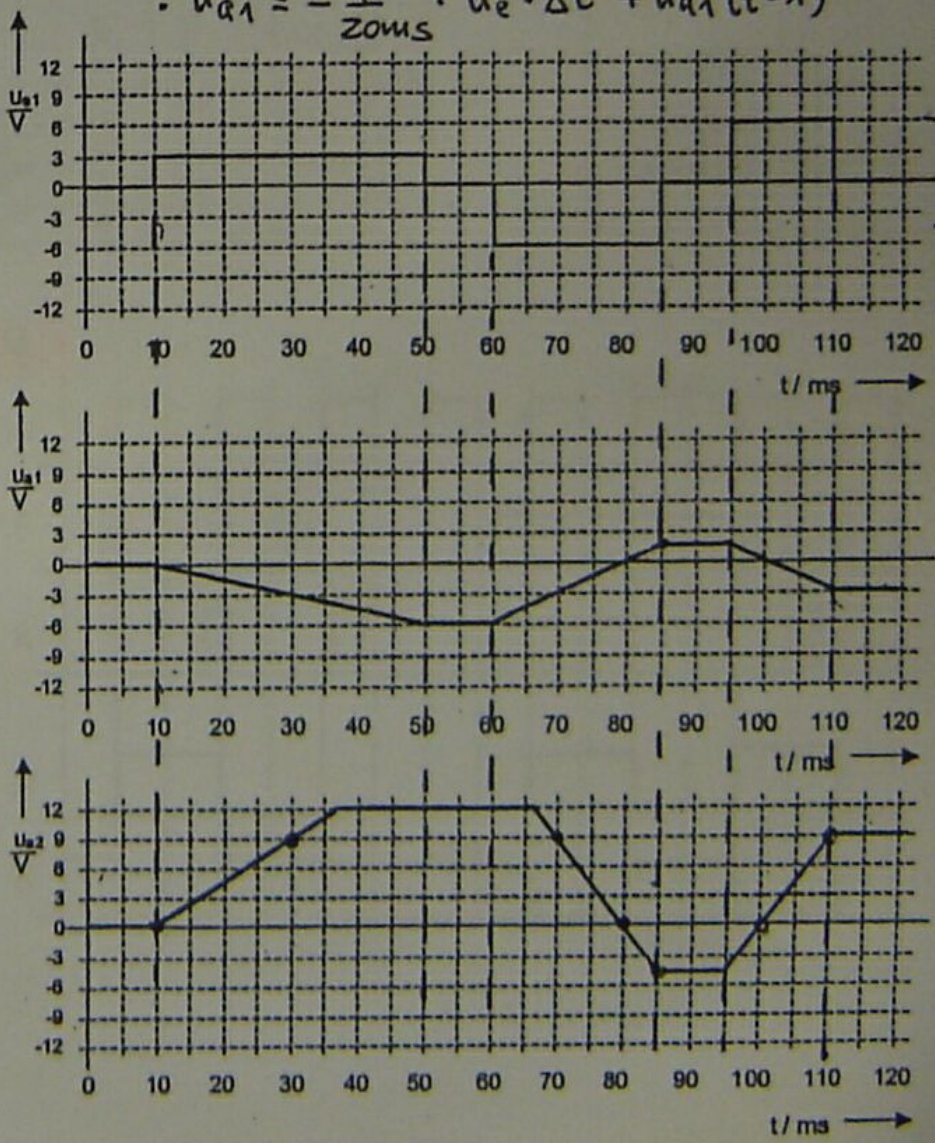
2.2 OP1: invertierender Integrator
OP2: invertierender Verstärker

2.3 $$U_{a1} = -\frac{1}{R_1 C} \cdot \int_0^t U_e(t)\,dt \quad \text{mit} \quad \frac{1}{R_1 C} = \frac{1}{20\,ms}$$

$$U_{a2} = -\frac{R_3}{R_2} U_{a1} = -3\,U_{a1}$$

2.4 Zeit in Bereiche zerlegen

! $U_{a1} = -\frac{1}{20ms} \cdot U_e \cdot \Delta t + U_{a1}(t-1)$

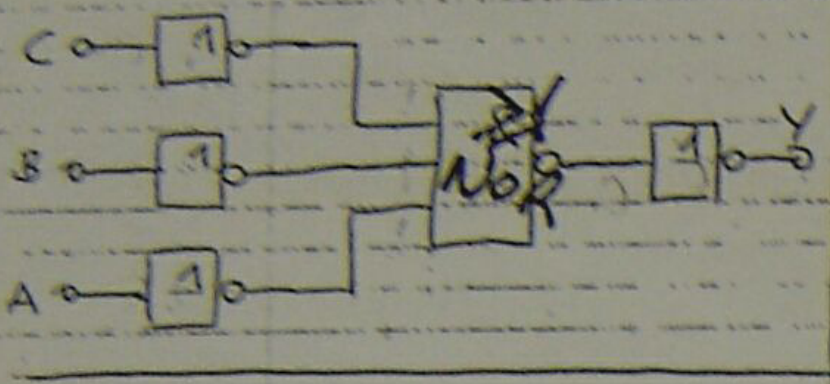


t	U_{a1}
10...50ms	$1 - \frac{1}{20ms} \cdot 3V \cdot 40ms = -6V$
50...60ms	$0 + U_{a1}(50ms) = -6V$
60...85ms	$7.5V - 6V = 1.5V$
85...95ms	$0 + U_{a1}(85ms) = 1.5V$
95...110ms	$-4.5V + 1.5V = -3V$
110...	$= 0 + U_{a1}(110ms) = -3V$

$U_{a2} = -3 \cdot U_{a1}$

Aufgabe 3

3.1



3.2

A	B	C	Y
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

3.3 ~~NAND~~ NAND

~~NOR~~

Aufgabe 5

5.1

I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8
$\frac{I}{2}$	$\frac{I}{4}$	$\frac{I}{8}$	$\frac{I}{16}$	$\frac{I}{32}$	$\frac{I}{64}$	$\frac{I}{128}$	$\frac{I}{256}$

5.2

$D = 165$

$$U_A = -2 \cdot \frac{U_{Ref}}{256} \cdot D = -2 \cdot \frac{5{,}12\,V}{256} \cdot 165 = -6{,}6\,V$$

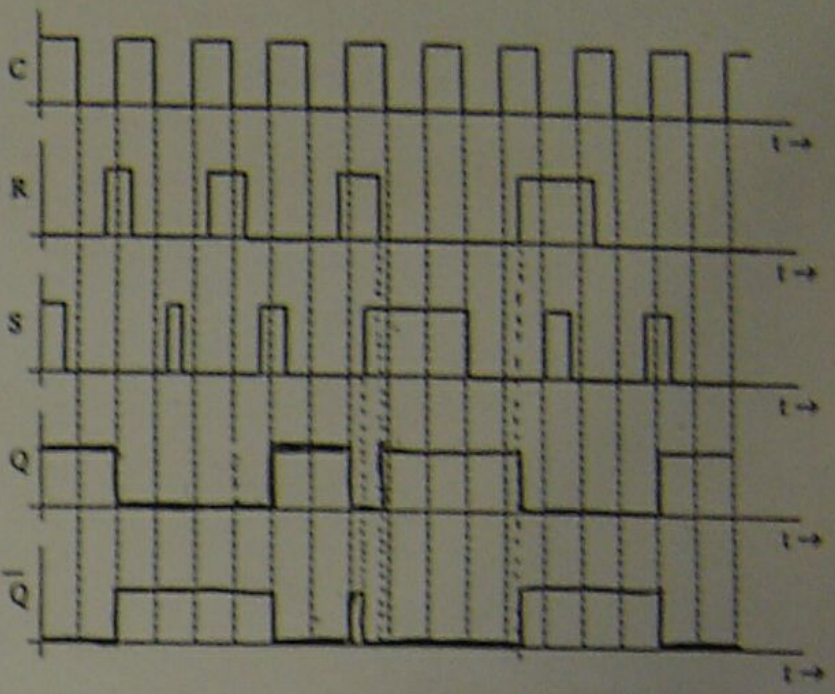
$$2^k \left(\frac{U_{ref}}{2^8} \right)$$

Aufgabe 4:

4.1

C	R	S	Q	$\overline{Q}$
0	X	X	Q_{-1}	$\overline{Q}_{-1}$
1	0	0	Q_{-1}	$\overline{Q}_{-1}$
1	0	1	1	0
1	1	0	0	1
1	1	1	0	0

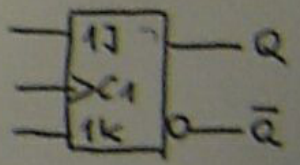
4.2



4.3

C	J	K	Q	$\overline{Q}$
0	X	X	Q_{-1}	$\overline{Q}_{-1}$
1	X	X	Q_{-1}	$\overline{Q}_{-1}$
⎍	0	0	Q_{-1}	$\overline{Q}_{-1}$
⎍	0	1	0	1
⎍	1	0	1	0
⎍	1	1	$\overline{Q}_{-1}$	Q_{-1}

logisches Symbol:



4.4