1a) $DEADBEEF_{16} = 1101\ 1110\ 1010\ 1101\ 1011\ 1110\ 1110\ 1111_2$

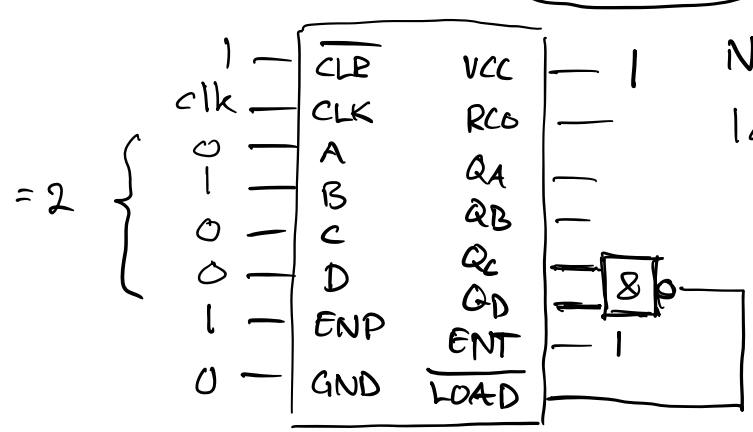
$A = 10_{10} = 1010_2$
$B = 11_{10} = 1011_2$
$C = 12_{10} = 1100_2$
$D = 13_{10} = 1101_2$
$E = 14_{10} = 1110_2$
$F = 15_{10} = 1111_2$

$1101\ 1110\ 1010\ 1101\ 1011\ 1110\ 1110\ 1111_2 =$
$= 3\ 3\ 6\ 5\ 3\ 3\ 3\ 7\ 3\ 5\ 7_8$

b) $abce' + ab'c + acd'f + abce =$

$= abc(e'+e) + ab'c + acd'f =$
$(e'+e) = 1$
$= abc + ab'c + acd'f =$
$= ac(b + b' + d'f) = ac$
$(b + b') = 1$
$(b + b' + d'f) = 1$

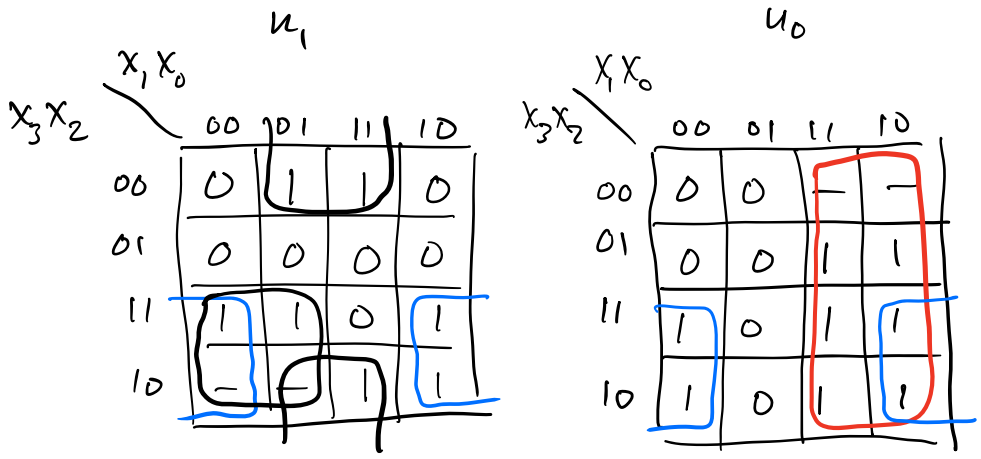
2. Krets ska räkna 2, 3, ..., 12



När $(Q_D, Q_C, Q_B, Q_A) = (1,1,0,0)$ ladda räknaren med 2.

3.

K-diagram



SP-form ⇒ ring a 1:or

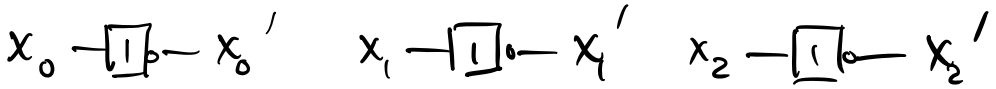
Uttryck

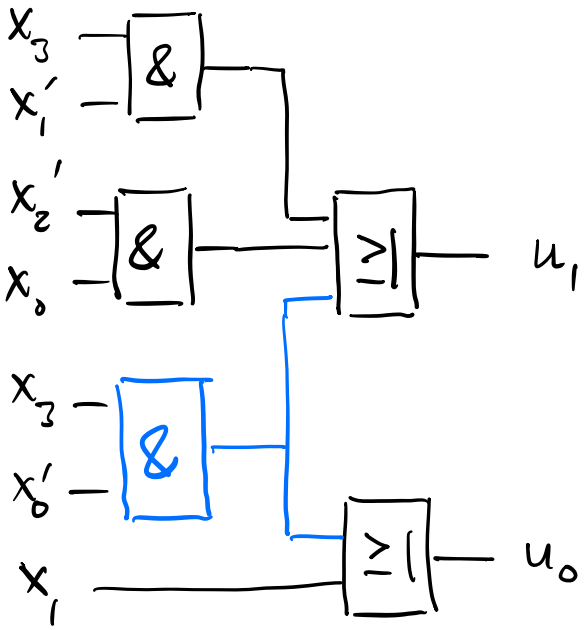
$u_1 = x_3 x_1' + x_2' x_0 + x_3 x_0'$

$u_0 = x_1 + x_3 x_0'$

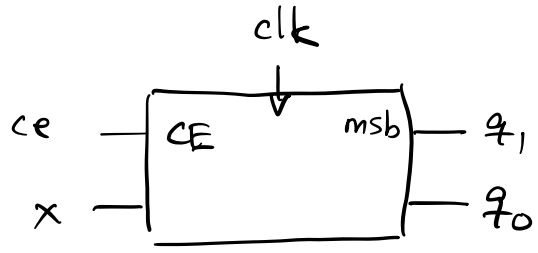
Grinddelning

Krets



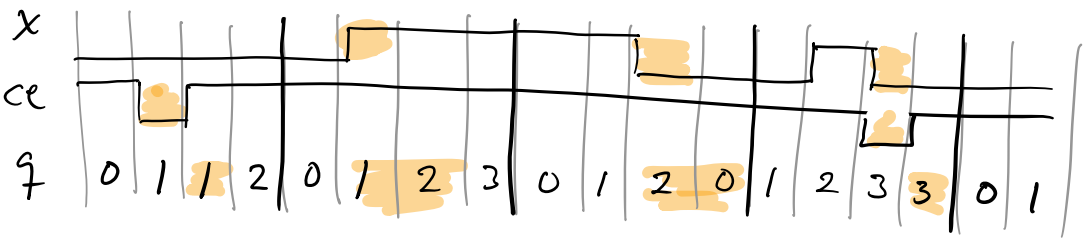


4.

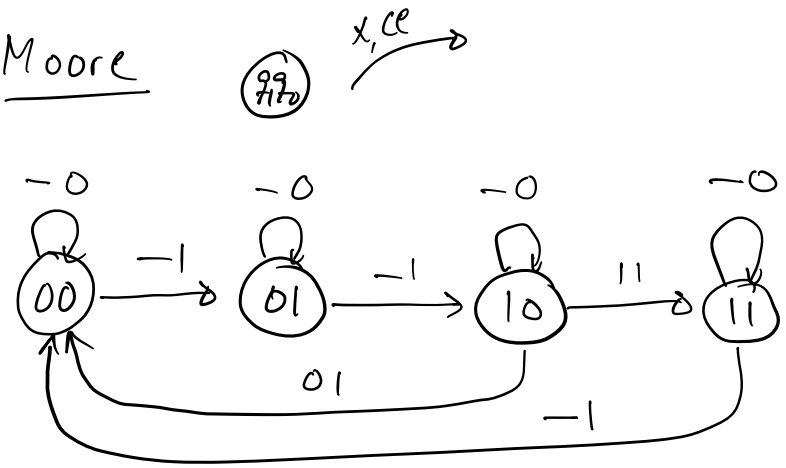


$q = (q_1, q_0)$

$$x = \begin{cases} 0 & 0 \to 1 \to 2 \\ 1 & 0 \to 1 \to 2 \to 3 \end{cases}$$



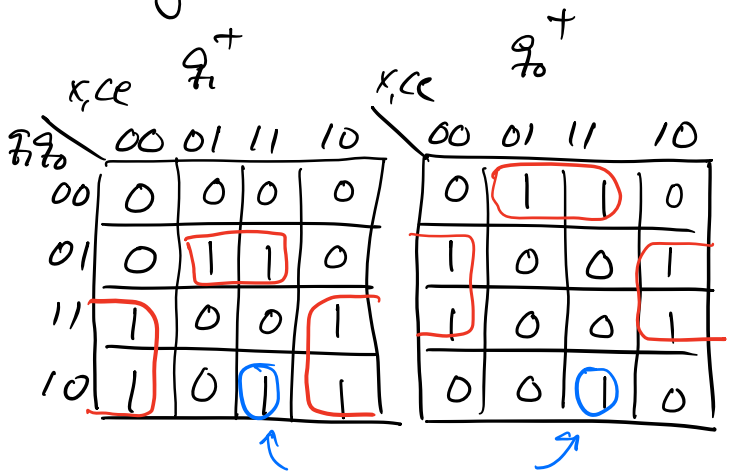
Moore



Tabell

q_1q_0	x,ce 00	01	11	10
	$q_1^+q_0^+$			
00	00	01	01	00
01	01	10	10	01
11	11	00	00	11
10	10	00	11	10

K-diagram



Grinddekning

NAND ⇒ Ringe 1:or

Uttryck

de Morgans

$$q_1^+ = \left(q_1 \cdot ce' + q_1' q_0 \cdot ce + q_1 q_0' \cdot x \cdot ce\right)'' =$$

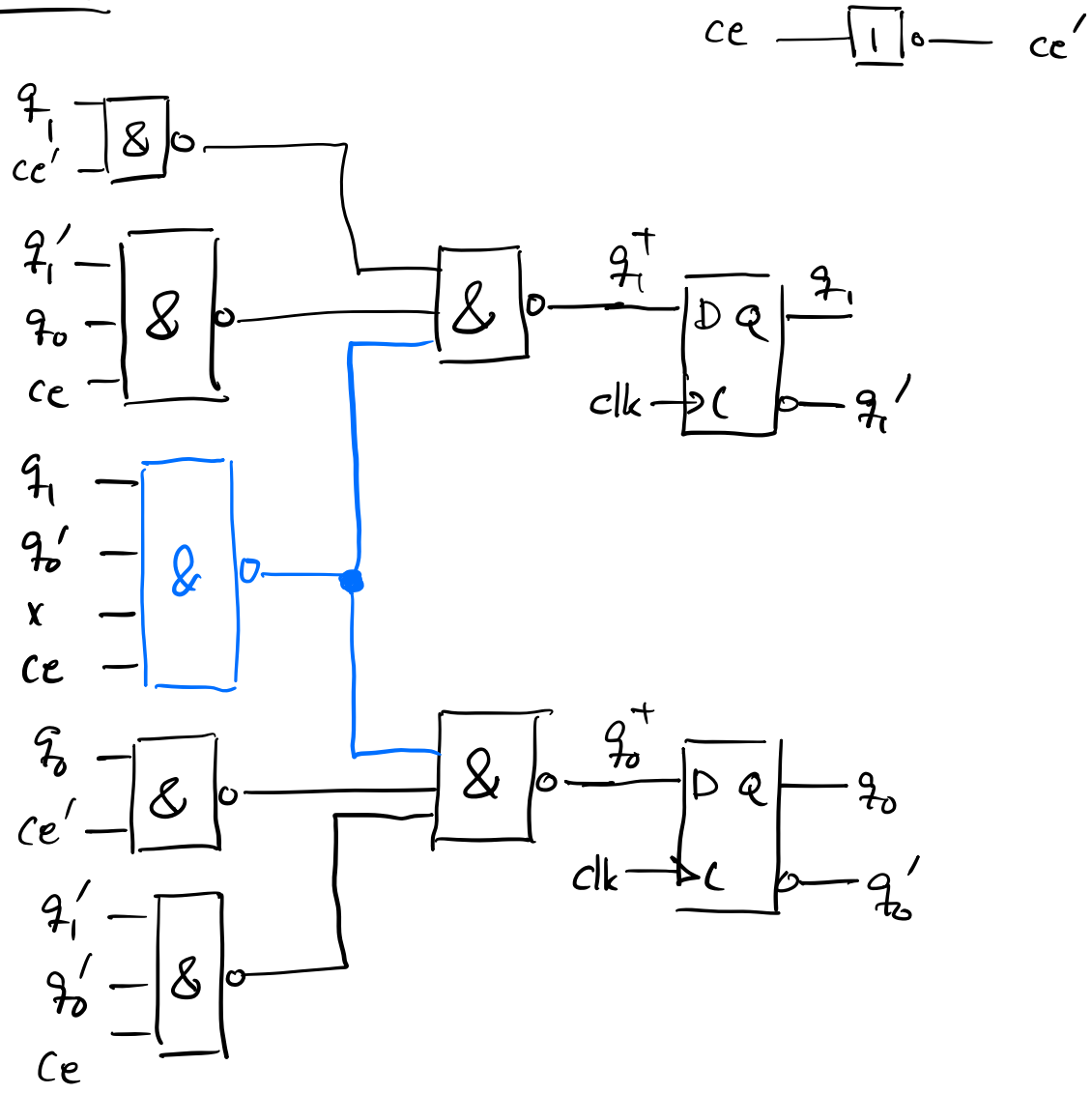
$$= \left(\left(q_1 \cdot ce'\right)' \cdot \left(q_1' \cdot q_0 \cdot ce\right)' \cdot \left(q_1 \cdot q_0' \cdot x \cdot ce\right)'\right)'$$

de Morgans

$$q_0^+ = \left(q_0 \cdot ce' + q_1' q_0' \cdot ce + q_1 q_0' x \cdot ce\right)'' =$$

$$= \left(\left(q_0 \cdot ce'\right)' \cdot \left(q_1' q_0' \cdot ce\right)' \cdot \left(q_1 \cdot q_0' \cdot x \cdot ce\right)'\right)'$$

Krets

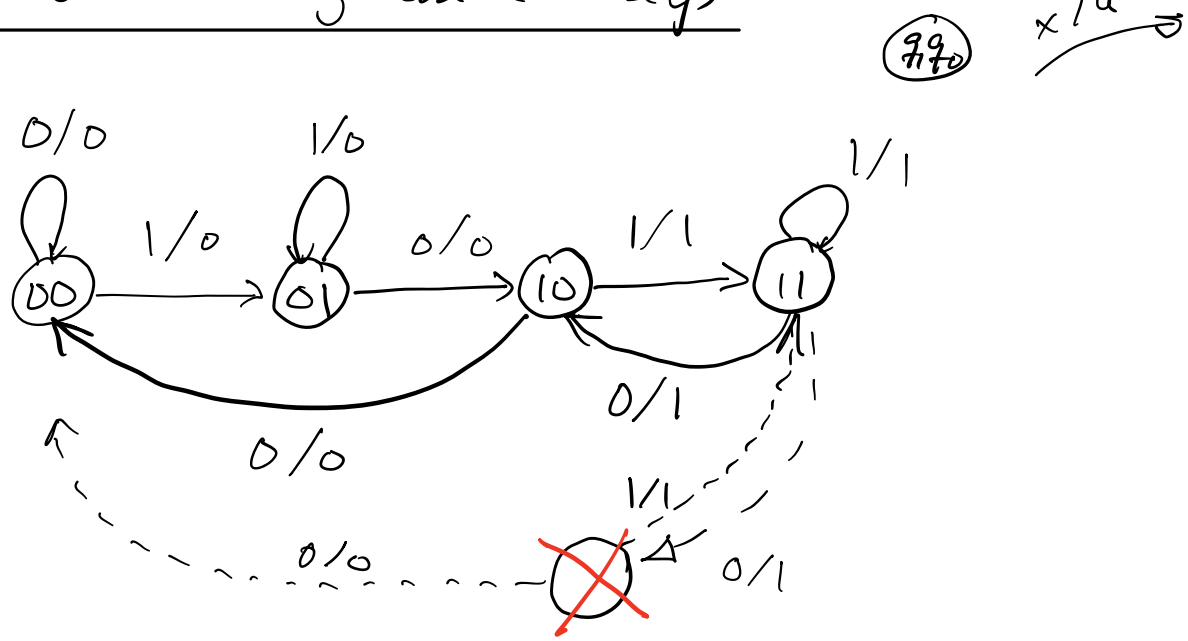


5. $u_1 = 0$

$x_{-1} = x_0 = 0$

$$u_i = \begin{cases} 1 & \text{om } (x_{i-2}, x_{i-1}, x_i) = (1,0,1) \\ 0 & \text{om } (x_{i-1}, x_i) = (0,0) \\ u_{i-1} & \text{för övrigt} \end{cases}$$

Tillståndsdiagram (Mealy)

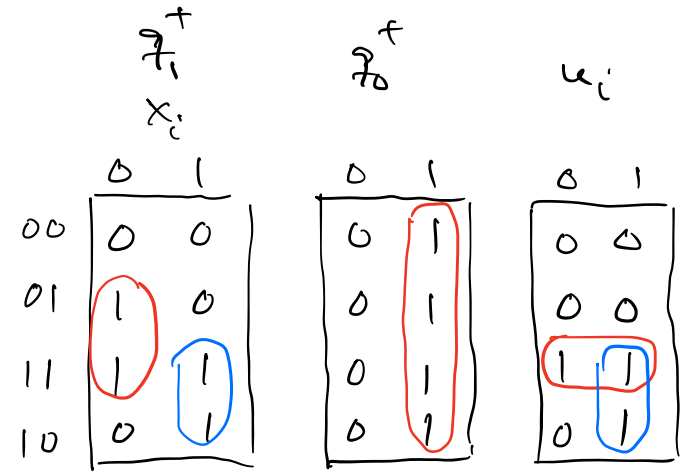


Detta tillstånd behövs ej, ty (16) kan återanvändas.

Tabell

$q_1 q_0$	$q_1^+ q_0^+ / u_i$ $x=0$	$x=1$
00	00/0	01/0
01	10/0	01/0
11	10/1	11/1
10	00/0	11/1

K-diag



Cell 1: $q_1 q_0 = 00$

$q_1^+ = 0$

$q_0^+ = x_1$

$u_1 = 0$

Cell 2 $q_1 q_0 \in \{00, 01\}$

$q_1^+ = q_0 x_2'$

$q_0^+ = x_2$

$u_2 = 0$

Cell 3 $q_1 q_0 \in \{00, 01, 10\}$

$q_1^+ = q_0 x_3' + q_1 x_3$

$q_0^+ = x_3$

$u = q_1 x_3$

Cell $k \in \{4, 5, \ldots, n-1\}$

$q_1^+ = q_0 x_k' + q_1 x_k$

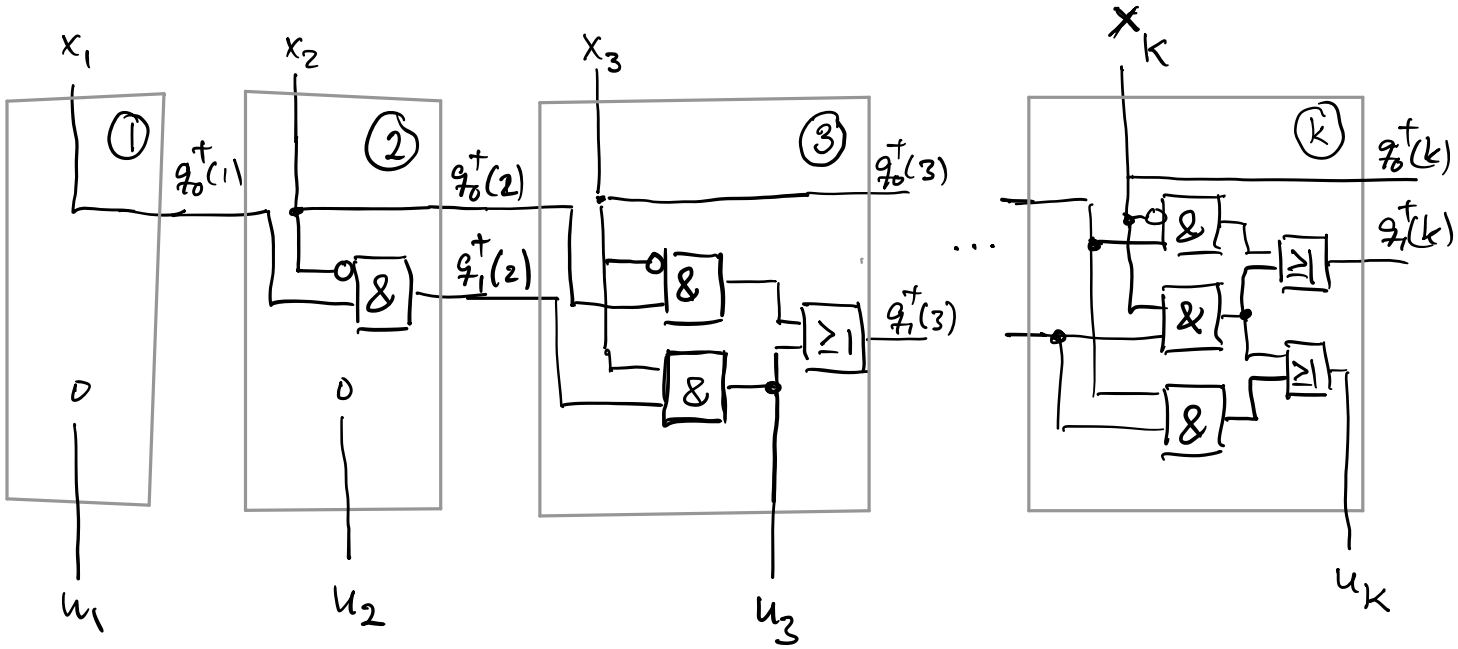
$q_0^+ = x_k$

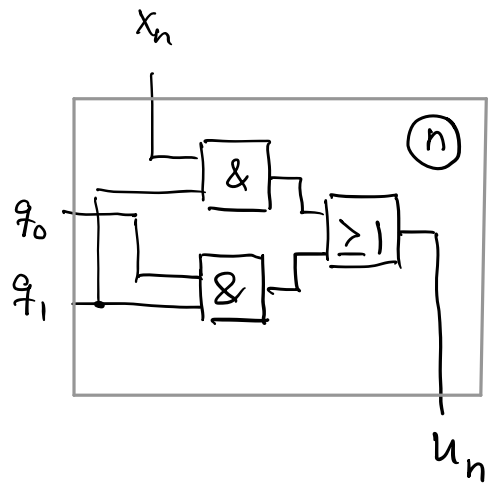
$u = q_1 q_0 + q_1 x_k$

Cell n

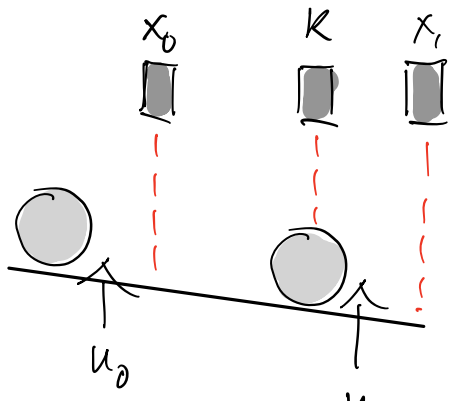
$u = q_1 q_0 + q_1 x_n$

Krets





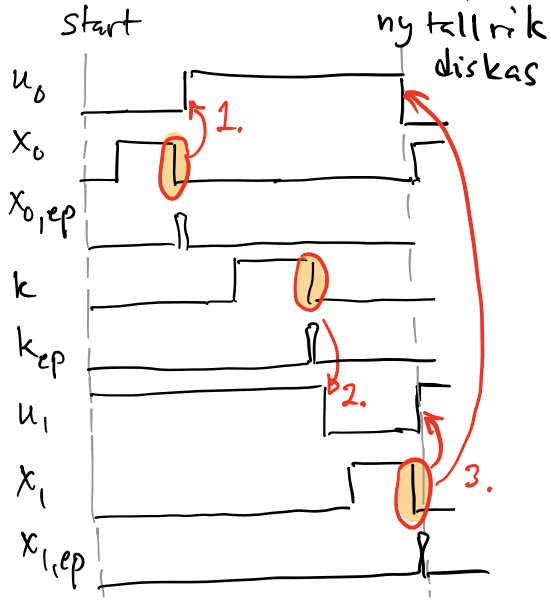
6.



$$u_i = \begin{cases} 1 & \text{stängd} \\ 0 & \text{öppen} \end{cases}$$

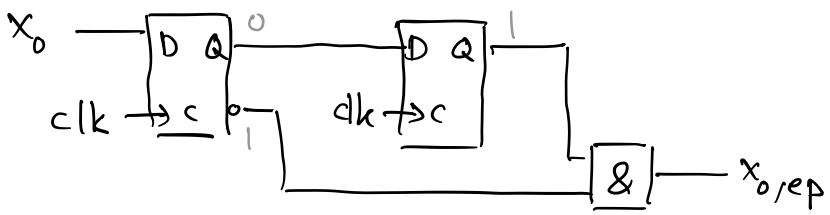
$$x_i = \begin{cases} 1 & \text{tallrik} \\ 0 & \text{tomt} \end{cases}$$

$$K = \begin{cases} 1 & \text{smutsig tallrik} \\ 0 & \text{tomt eller ren tallrik} \end{cases}$$



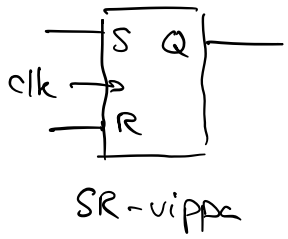
1. När x_0 går låg ska u_0 sättas till 1.
2. När k går låg ska u_1 sättas till 0.
3. När x_1 går låg ska u_0 sättas till 0 och u_1 sättas till 1.

Insignalerna x_0, x_1 och k ska synkroniseras och enpulsas på övergång från 1 till 0.

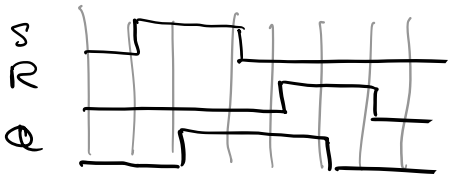


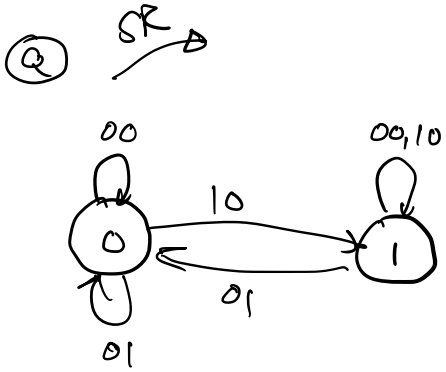
Liknande krets för x_1 och k.

För utsignalerna behövs en krets som kan slås på med en signal (set, S) och slås av med en signal (reset, R).



SR-vippa



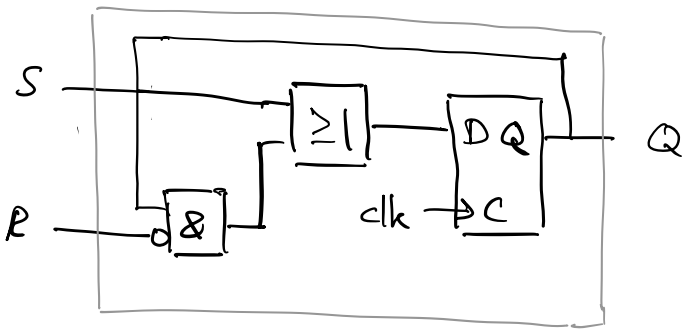


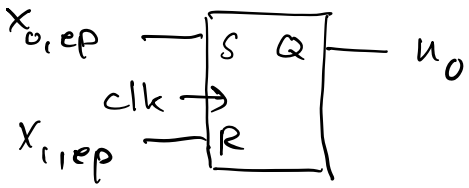
Q^+

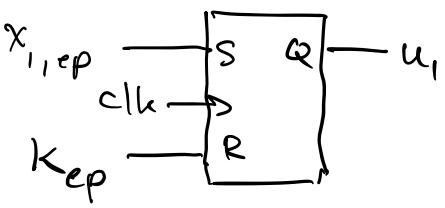
Q \ SR	00	01	11	10
0	0	0	–	1
1	1	0	–	1

SR = 11 ⇒ don't care

$$Q^+ = S + Q \cdot R'$$







Initialtillstånd

Vid start är alla signaler 0 utom $u_1 = 1$. Alltså ska alla vippor nollställas utom u_1:s vippa som ska sättas till 1.

Fördröjningen från in- till ut-signal är 1-2 klockpulser vilket är enligt specifikation.