Digitalna vezja
UL, FRI

Vaja 8, Registri, Števci (protoboard)

MSI integracija

Protoboard

MSI (Medium Scale Integration) – nekaj 100 transistorjev v integriranem vezju

Integrirana vezja v TTL logiki, serija 7400

Vrata:

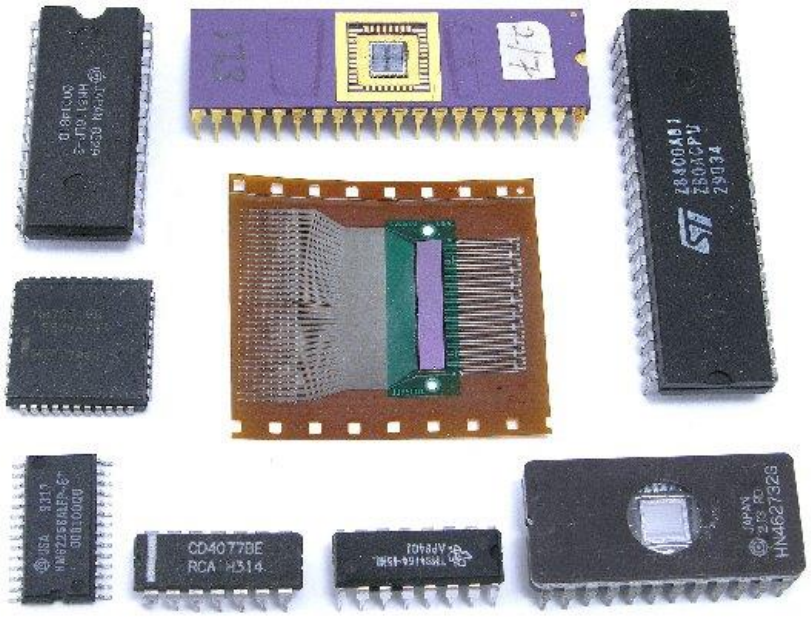
- 7404 – NOT
- 7408 – AND
- 7432 – OR
- 7486 - XOR

Multiplekserji:

- 74157 - 2/1 MUX
- 74155 – 4/1 MUX

Pomnilne celice

- 7474 – D pomnilna celica



Semafor: https://www.youtube.com/watch?v=rrFDg97Yl7s

MSI integracija

Protoboard

- MSI (Medium Scale Integration) – nekaj 100 transistorjev v integriranem vezju
- Integrirana vezja v TTL logiki, serija 7400

Logična vrata:

- 7400 – NAND, http://pdf1.alldatasheet.com/datasheet-pdf/view/12608/ONSEMI/7400.html
- 7408 - AND, http://www.ti.com/lit/ds/symlink/sn54s08.pdf
- 7432 - OR, http://www.ti.com/lit/ds/symlink/sn54s32.pdf
- 7486 – XOR, http://www.ti.com/lit/ds/symlink/sn54s86.pdf

Multiplekserji:

- 74157 - 2/1 MUX, http://www.ti.com/lit/ds/symlink/sn54s157.pdf
- 74155 – 4/1 MUX, http://www.ti.com/lit/ds/symlink/sn54s153.pdf

Pomnilne celice:

- 7474 – D pomnilna celica, http://www.ti.com/lit/ds/symlink/sn54s74.pdf

Vaja 7 (DN1) Register

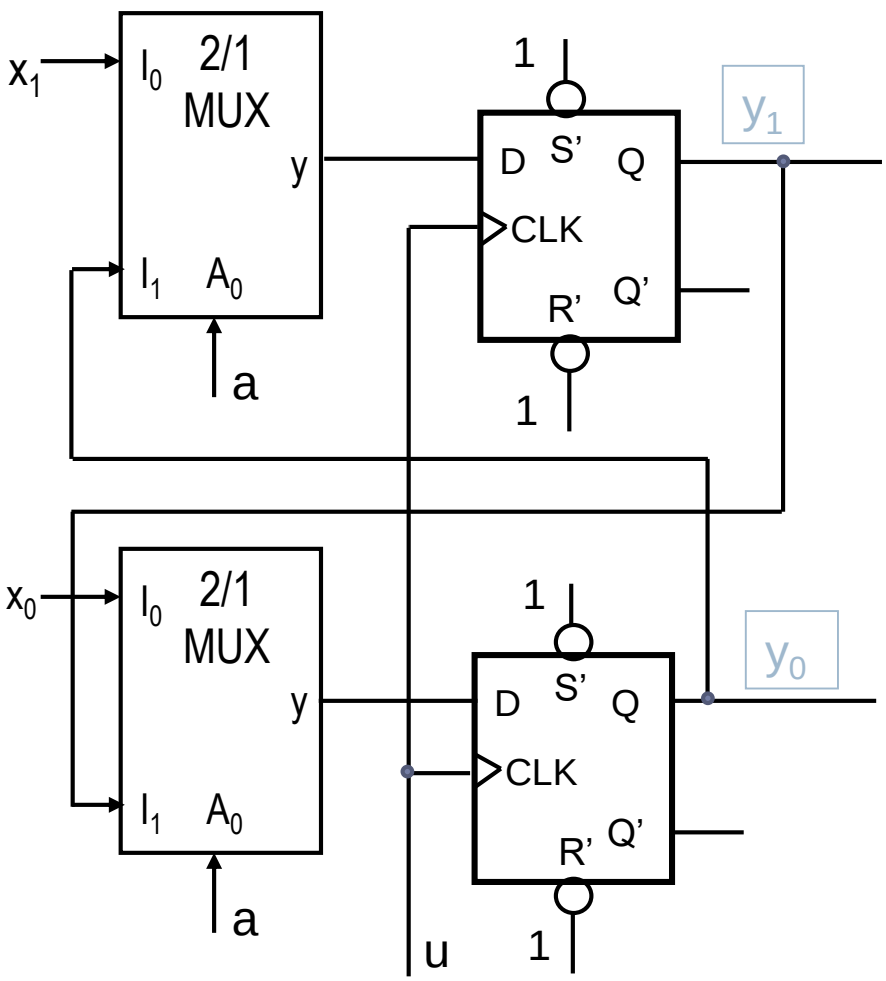
- Definirajte 2-bitni register $Y=(y_1, y_0)$ v tabeli stanj. Krmilni vhod a določa:
  - a=0: Vpis: $Y(t+1)=X$, kjer je $X=(x_1, x_0)$
  - a=1: ciklični pomik desno
- Naloge:
  - Zapišite tabelo stanj delovanja registra
  - Zapišite krmilni funkciji za D pomnilni celici z uporabo:
    - NAND operatorjev
    - 2/1 MUXov
  - Realizirajte register v logisimu za obe rešitvi
  - Realizirajte register na protoboardu:

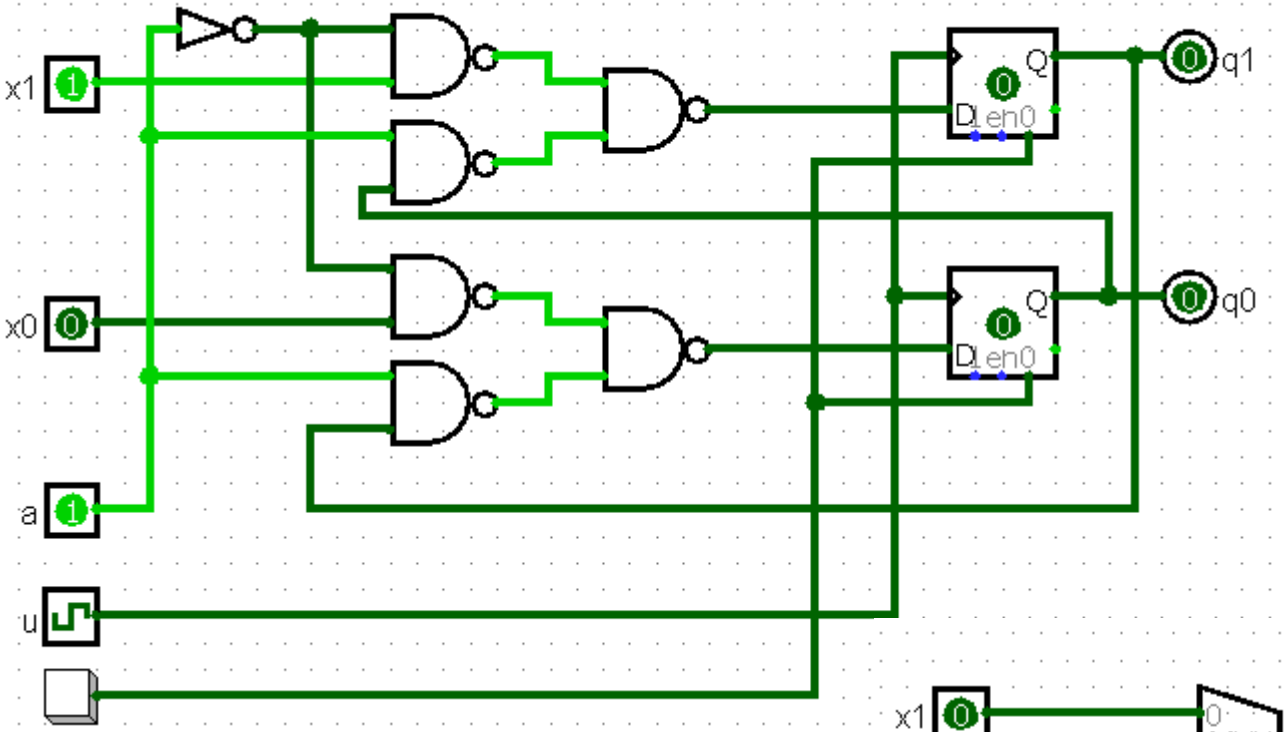
R1 – D pomnilna celica, NAND, 2/1MUX

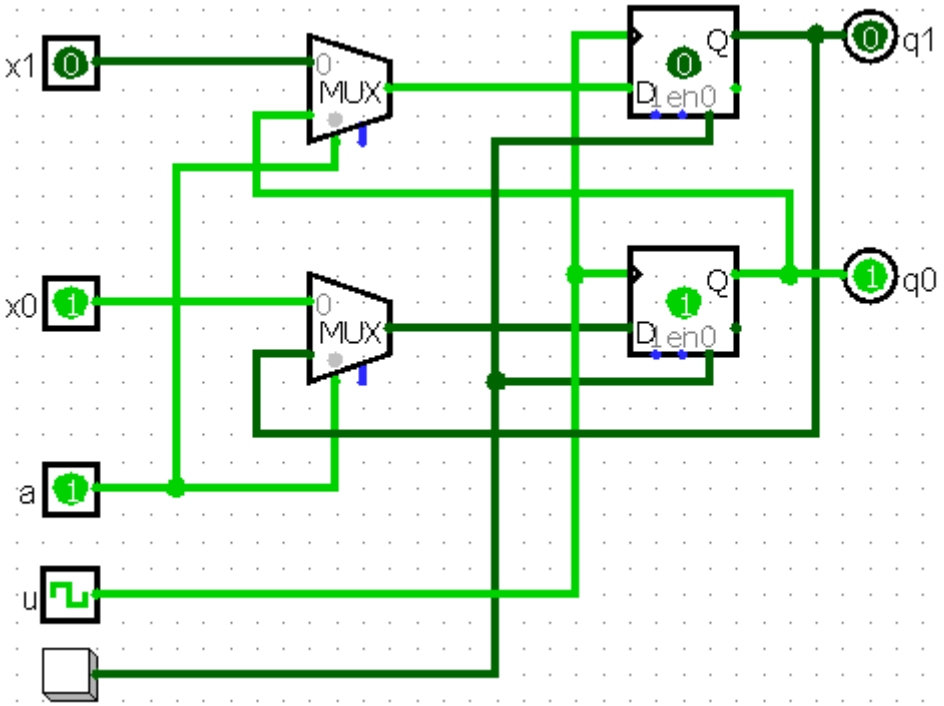
a	y_1	y_0	$y_1=D_1$	$y_0=D_0$
	(t)	(t)	(t+1)	(t+1)
0	0	0	x_1	x_0
0	0	1	x_1	x_0
0	1	0	x_1	x_0
0	1	1	x_1	x_0
1	0	0	0	0
1	0	1	1	0
1	1	0	0	1
1	1	1	1	1

$$D_1 = \bar{a}.x_1 \vee a.y_0 = (\bar{a} \uparrow x_1) \uparrow (a \uparrow y_0)$$

$$D_0 = \bar{a}.x_0 \vee a.y_1 = (\bar{a} \uparrow x_0) \uparrow (a \uparrow y_1)$$




x1
x0
a
u
Q
D
en
q1
q0

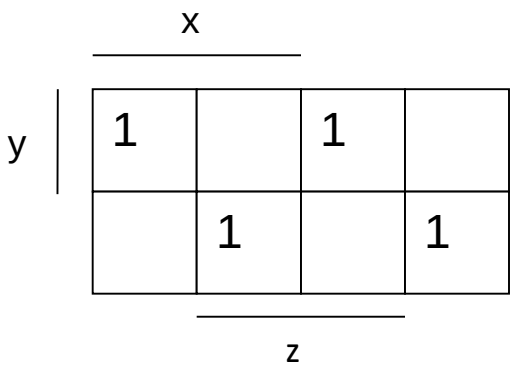

x1
x0
a
u
MUX
MUX
Q
D
en
q1
q0

Vaja 7 (DN2) Števec

- Definirajte 2-bitni števec $Q=(Q_1, Q_0)$v tabeli stanj. Krmilni vhod a določa:
  - a=0: M=4, Dekrement, k=1
  - a=1: M=4 Inkrement, k=1
- Naloge:
  - Zapišite tabelo stanj delovanja registra
  - Zapišite krmilni funkciji za D pomnilni celici z uporabo
    - XOR operatorjev
    - 4/1 MUXov
  - Realizirajte števec v logisimu
  - Realizirajte register na protoboardu

R2 – D pomnilna celica, XOR, 4/1MUX

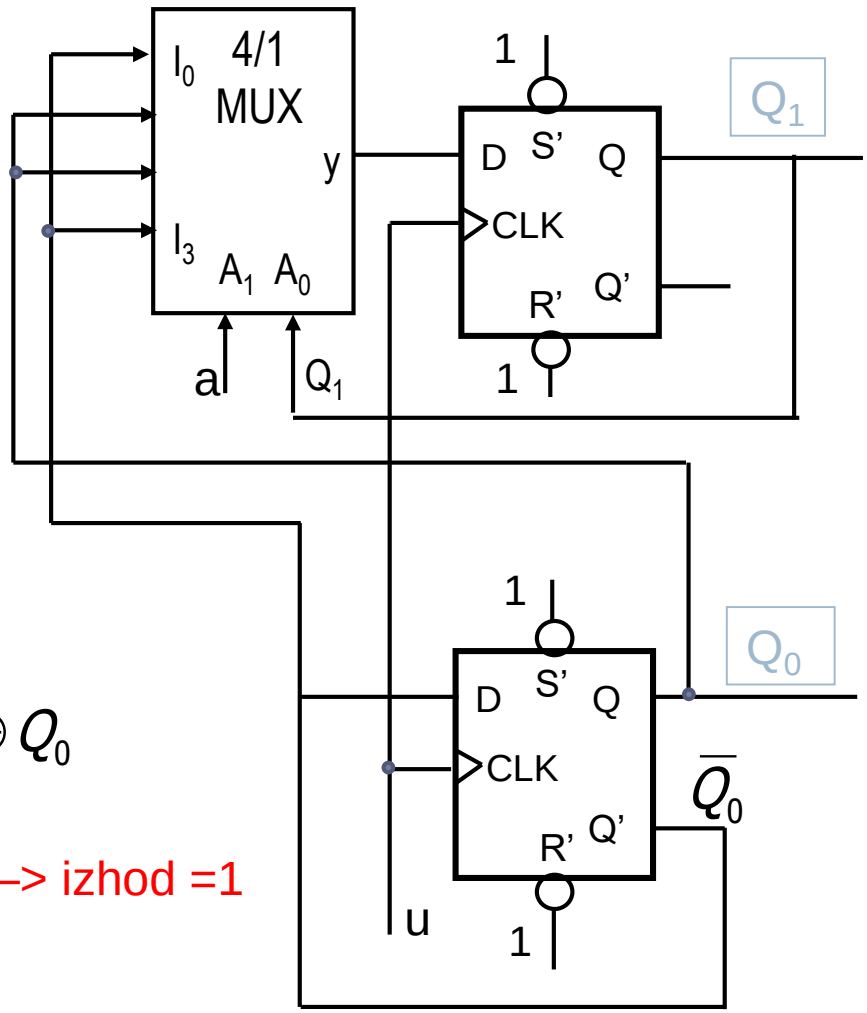
a	Q_1	Q_0	Q_1	Q_0
	(t)	(t)	(t+1)	(t+1)
0	0	0	1	1
0	0	1	0	0
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	1
1	1	1	0	0

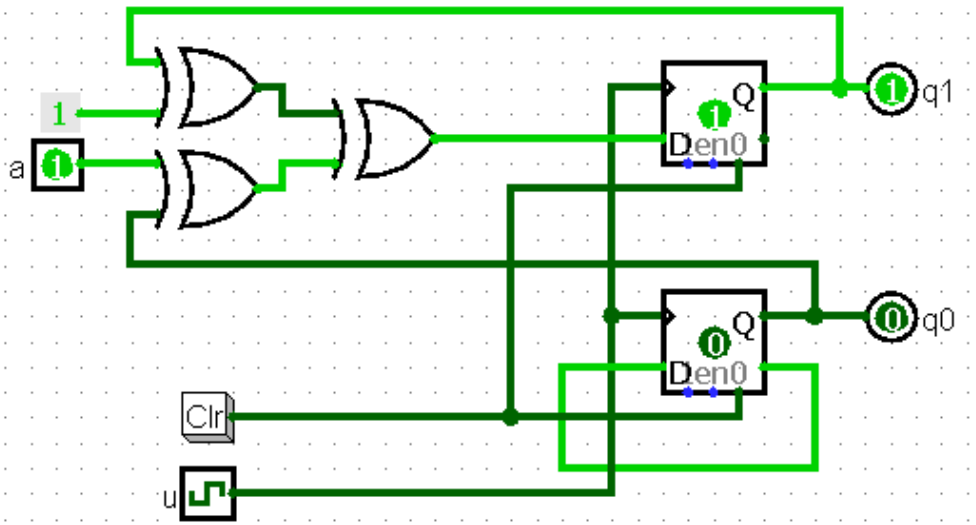


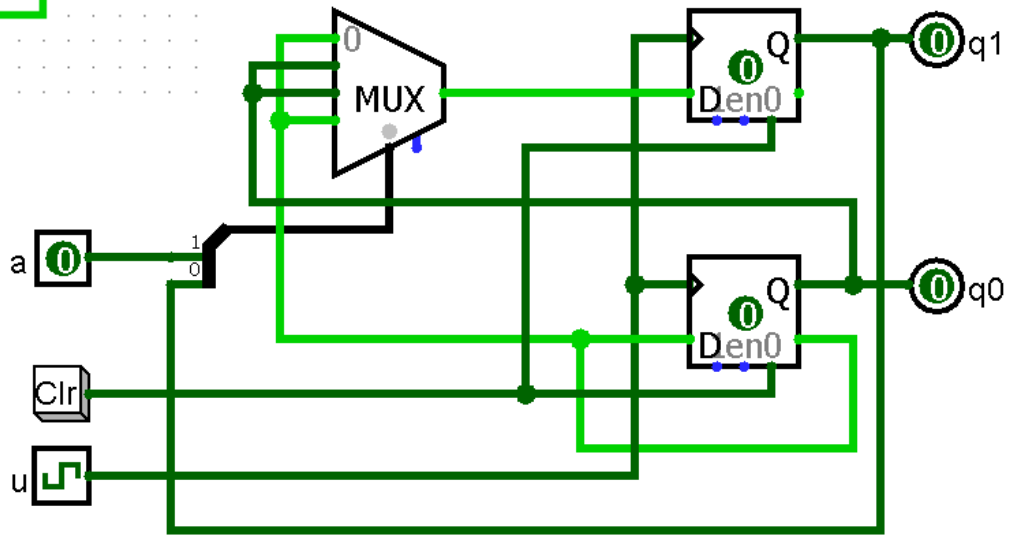
$$D_1 = 1 \oplus a \oplus Q_1 \oplus Q_0$$

XOR v logisim
nastaviti liho št 1 –> izhod =1

$$D_0 = \overline{Q}_0$$




1
a
Q
Den0
q1
Q
Den0
q0
Clr
u


0
MUX
Q
Den0
q1
a
1
0
Q
Den0
q0
Clr
u