Fundusze Europejskie
Wiedza Edukacja Rozwój

Unia Europejska
Europejski Fundusz Społeczny

Politechnika Śląska jako Centrum Nowoczesnego Kształcenia
opartego o badania i innowacje

POWR-03.05.00-00-Z098/17-00

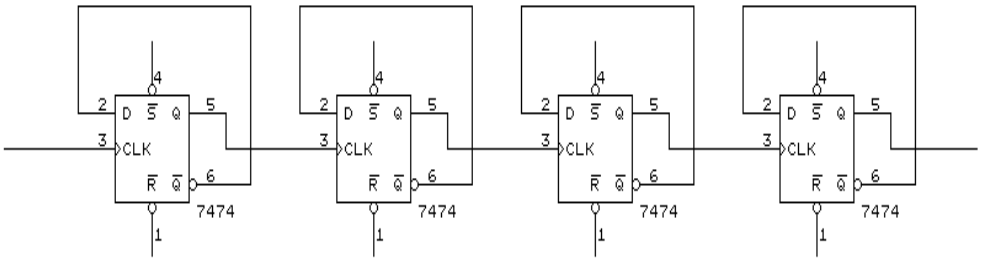
Digital Circuits Design

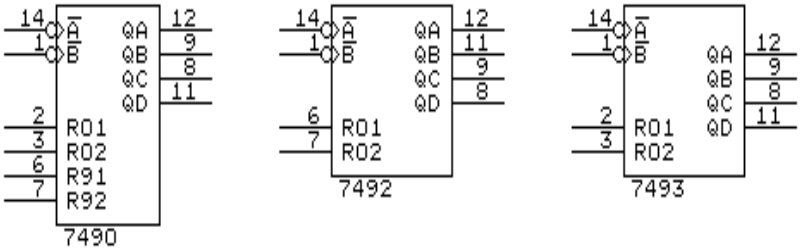
Faculty of Automatic Control, Electronics and Computer Science / Informatics, Engineer Degree, sem. 3

Materiały dydaktyczne współfinansowane przez Unię Europejską ze środków Europejskiego Funduszu Społecznego

Counters

Asynchronous counters

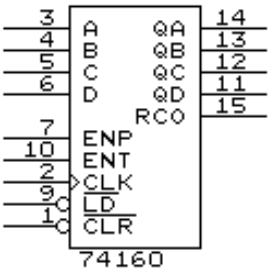




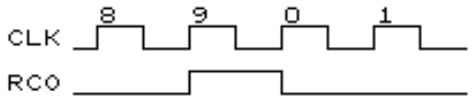
Synchronous counters

Synchronous 1-directional counters

Circuit	Counter	Load	Clear
74160	Decimal	Synchronous	Asynchronous
74161	Binary	Synchronous	Asynchronous
74162	Decimal	Synchronous	Synchronous
74163	Binary	Synchronous	Synchronous

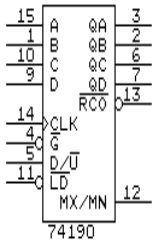


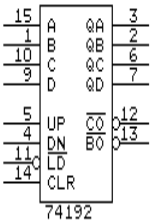
RCO output timing

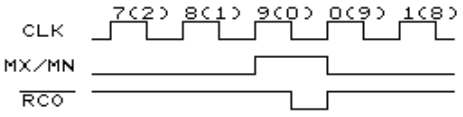


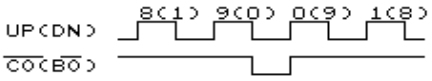
Synchronous bi-directional couters

Circuit	Counter	Count direction	Load	Clear
74190	Decimal	Direction input	Asynchronous	-
74191	Binary	Direction input	Asynchronous	-
74192	Decimal	Up/down inputs	Asynchronous	Asynchronous
74193	Binary	Up/down inputs	Asynchronous	Asynchronous



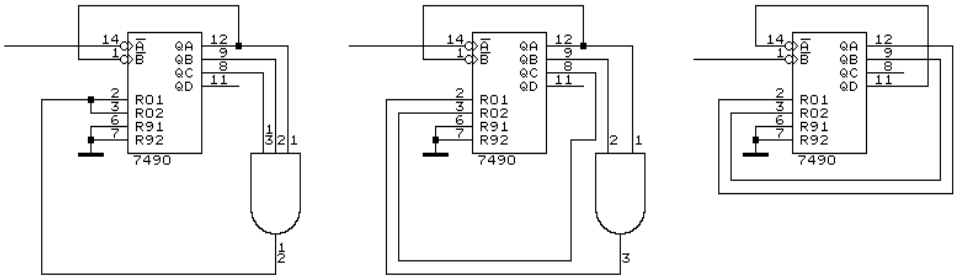






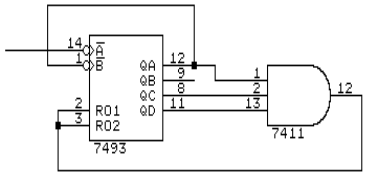
Example 1

Design asynchronous couters mod 7 couting in 8421 i 5421 codes.



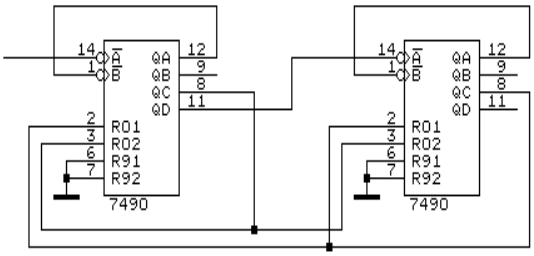
Example 2

Design asynchronous counter mod 13.



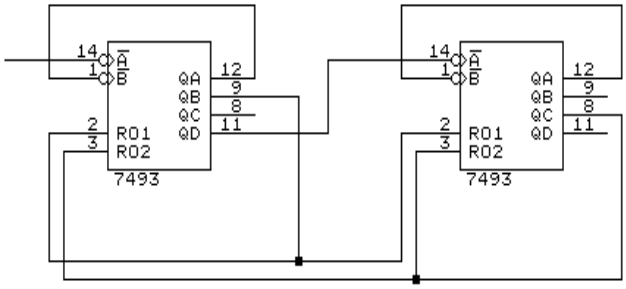
Example 3

Design asynchronous counter mod 44 without any other elements.



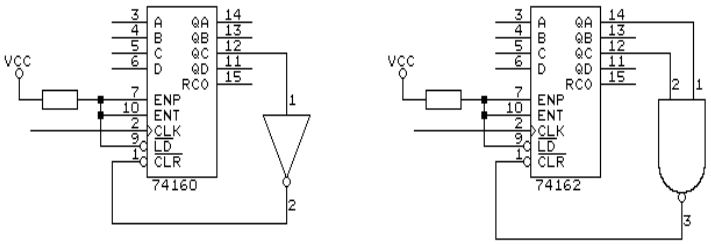
Example 4

Design asynchronous counter mod 66 without any other elements.



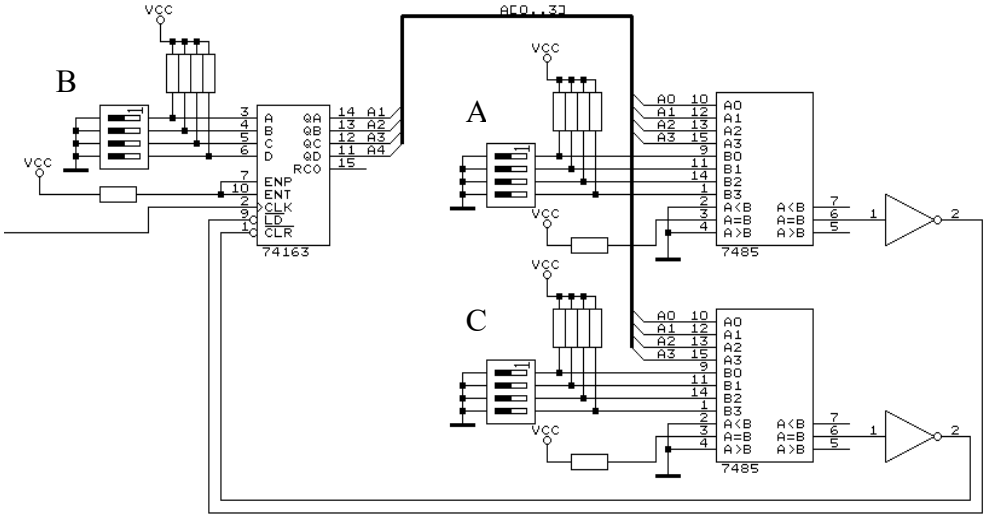
Example 5

Design synchronous counter mod 5, using circuits with synchronous or asynchronous clear.



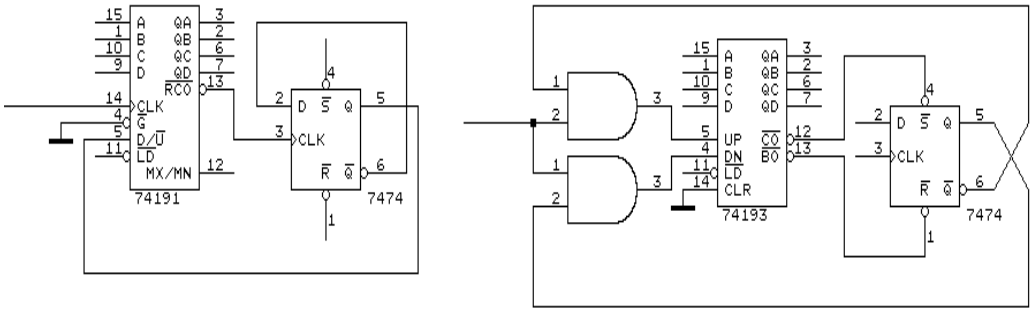
Example 6

Design synchrounous counter counting as following: 0, ..., A, B, ..., C, 0 etc. (A<B<C). Assume both load and clear are synchronous.



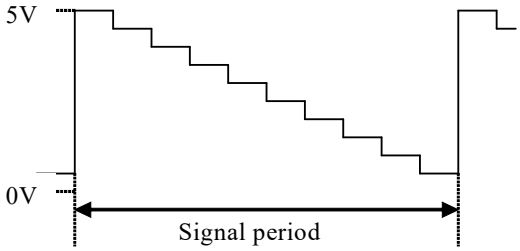
Example 7

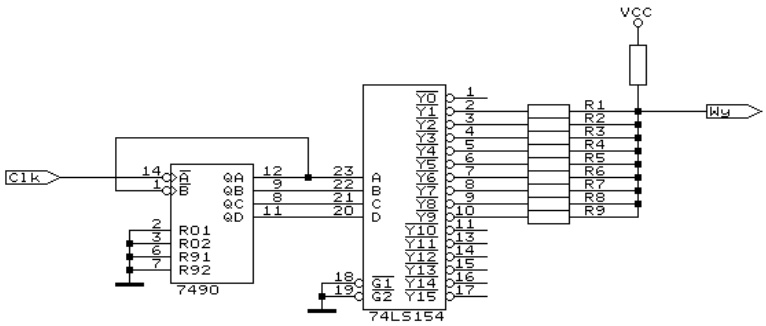
Design synchrounous counter counting as following: 0, 1, ..., 14, 15, 14, ..., 1, 0, 1 etc. Assume both load and clear are asynchronous. Use bidirectional couters with up/down inputs and direction selection.



Example 8

Design a „digitised sawtooth" signal generator, using a counter and a demultiplexer.





Resistor	Value [Ω]	Output voltage [V]
R0	–	5,0
R1	9100	4,5
R2	3900	4,0
R3	2400	3,5
R4	1500	3,0

R5	1000	2,5
R6	680	2,0
R7	430	1,5
R8	240	1,0
R9	110	0,5