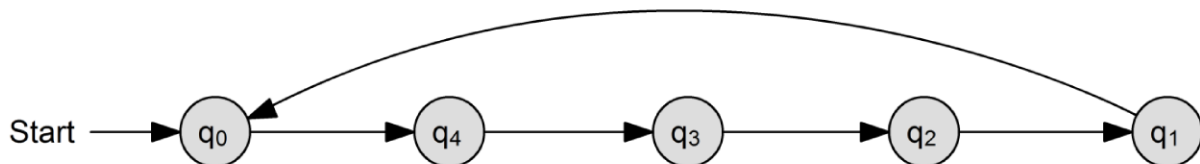


Counters

Please do the following exercises individually.

State diagram

Please draw the state diagram of a mod-5 down counter.



Operating mode

Please fill in the output of a 4516 counter.

CP-Ticks	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
MR	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
$\overline{\text{CE}}$	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
$\text{UP}/\overline{\text{DN}}$	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0
D0 ... D3	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
PL	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Q0 ... Q3	0	1	2	2	2	14	15	0	1	2	3	2	1	0	15	0
$\overline{\text{TC}}$	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	0

Countdown

You want to have a countdown from 9 to 0. Which counter will you use, what will you do to get a countdown and how can you use it?

- A BCD counter will be used
- Actions necessary to configure the BCD counter
 1. Disable counter
 2. Preload 9
 3. Select down direction
 4. Enable counter
- The overflow signal indicates that the countdown has finished