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.

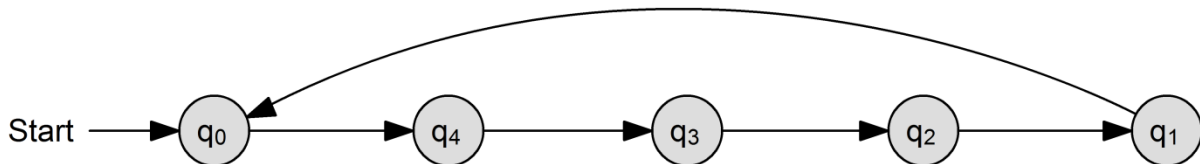| CP-Ticks	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
MR	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
$\overline{CE}$	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
UP/$\overline{DN}$	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0
D0 … D3	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
PL	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Q0 … Q3																
$\overline{TC}$																

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?

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UP/$\overline{DN}$	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
$\overline{TC}$	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