Asynchronous Truncated Counter and Decade Counter

As there is a maximum output number for Asynchronous counters like **MOD-16** with a resolution of 4-bit, there are also possibilities to use a basic Asynchronous counter in a configuration that the counting state will be less than their maximum output number. Modulo or MOD counters are one of those types of counters. The configuration made in such a way that the counter will reset itself to zero at a pre-configured value and has **truncated** sequences.

So, if a counter with the specific number of resolutions (**n-bit Resolution**) count up to is called as **full sequence counter** and on the other hand, if it is count less than the maximum number, is called as a **truncated counter**.

To get the advantage of the asynchronous inputs in the flipflop, Asynchronous Truncated counter can be used with combinational logic.

Modulo 16 asynchronous counter can be modified using additional logic gates and can be used in a way that the output will give a decade (**divided by 10**) counter output, which is useful in counting standard decimal numbers or in arithmetic circuits. This type of counters called as **Decade Counters**.Decade Counters requires resetting to zero when the output reaches a decimal value of 10.

If we count 0-9 (10 steps) the binary number will be –

Number Count	**Binary Number**	**Decimal Value**
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9

So, When the output reaches to **1001** (BCD = 9), the counter needs to be reset. To reset the counter, we need to feed this condition back to the reset input. Counter which counts **0000** (BCD = 0) to **1001** (BCD = 9), is referred as BCD or **Binary-coded Decimal counter.**