07-CNT-Synchronous_Counter

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1 07 - CNT - Synchronous Counter

1.1 Up counter

0 => 1 => 2 => 3 ...

1.1.1 D-FlipFlops

$$D_0 = Q_0 \oplus 1 = \overline{Q_0}$$
$$D_1 = Q_1 \oplus Q_0$$
$$D_2 = Q_2 \oplus Q_1 Q_0$$
$$D_3 = Q_3 \oplus Q_2 Q_1 Q_0$$

1.1.2 T-FlipFlops

$$T_0 = 1$$
$$T_1 = Q_0$$
$$T_2 = Q_1 Q_0$$
$$T_3 = Q_2 Q_1 Q_0$$

1.2 Translation Table

1.2.1 D-FF

Q	Q^+	D
0	0	0
0	1	1
1	0	0
1	1	1

1.2.2 T-FF

Q	Q^+	T
0	0	0
0	1	1
1	0	1
1	1	0

1.2.3 DE-FF

Q	Q^+	E	D
0	0	01	-0
0	1	1	1
1	0	0	0
1	1	11	-1