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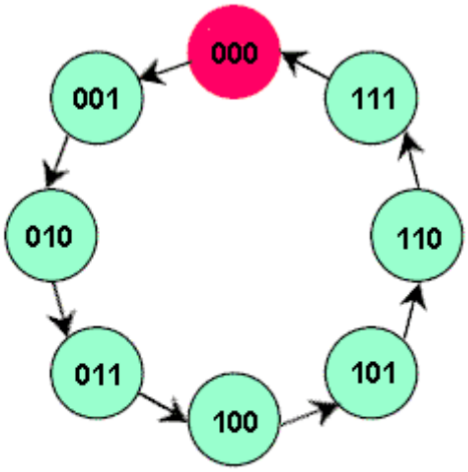
Build a 0 to 7 counter using D Flip Flops



We want to buld a counter like above using D type Flip Flops.
Following are the steps to do that:-

1. State table of the Counter
2. K-Maps for D_2,D_1,D_0
3. Simplfied Boolean expressions of D_2,D_1,D_0
4. Counter circuit diagram

Excitation table of D Flip Flop

Q_t	Q_{t+1}	D
0	0	0
0	1	1
1	0	0
1	1	1

Counter

State table of Counter

Q_t			Q_{t+1}			Q_2	Q_1	Q_0
Q_2	Q_1	Q_0	Q_2	Q_1	Q_0	D_2	D_1	D_0
0	0	0	0	0	1	0	0	1
0	0	1	0	1	0	0	1	0
0	1	0	0	1	1	0	1	1
0	1	1	1	0	0	1	0	0
1	0	0	1	0	1	1	0	1
1	0	1	1	1	0	1	1	0
1	1	0	1	1	1	1	1	1
1	1	1	0	0	0	0	0	0

K-Maps

D_2 – Map

Q_2Q_1 \ Q_0	0	1
00	0	0
01	0	1
11	1	0
10	1	1

$$D_2 = Q_2.Q_0' + Q_2.Q_1' + Q_2'.Q_1.Q_0$$
$$= Q_2.(Q_0' + Q_1') + Q_2'.Q_1.Q_0$$
$$= Q_2.(Q_0.Q_1)' + Q_2'.Q_1.Q_0$$

D_1 - Map

Q_2Q_1 \ Q_0	0	1
00	0	1
01	1	0
11	1	0
10	0	1

$$D_1 = Q_1.Q_0' + Q_1'.Q_0$$
$$= Q_1 \oplus Q_0$$

D_0 - Map

Q_2Q_1 \ Q_0	0	1
00	1	0
01	1	0
11	1	0
10	1	0

$D_0 = Q_0'$

Counter Circuit Diagram