

EGC220

Class Notes

4/25/2023

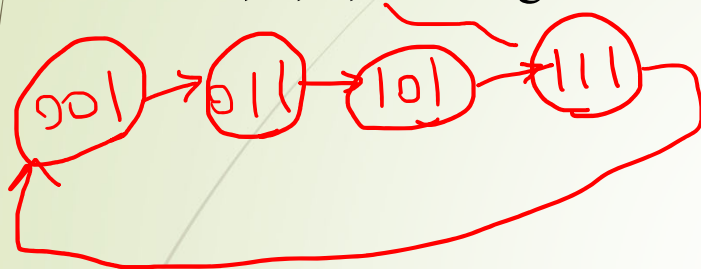
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Problem 1

Using D flip-flops, design a counter with the following repeated binary sequence 1, 3, 5, 7. Assign the sequence as state values.



3 F/F

No input
No output

$Q(t)$	$Q(t+1)$	D
0	0	0
0	1	1
1	0	0
1	1	1

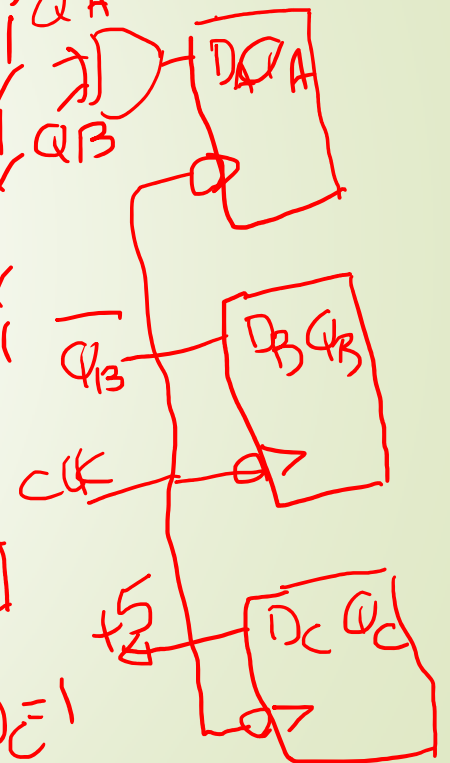
$$D_A = Q_A \bar{Q}_B + \bar{Q}_A Q_B$$

$$Q_A \oplus Q_B$$

Q_A	Q_B	Q_C	D_A	D_B	D_C
0	0	0	X	X	X
0	0	1	0	1	0
0	1	0	X	X	0
0	1	1	X	0	0
1	0	0	X	X	0
1	0	1	X	0	0
1	1	0	X	X	0
1	1	1	X	0	0

X	1	0	X
X	1	0	X

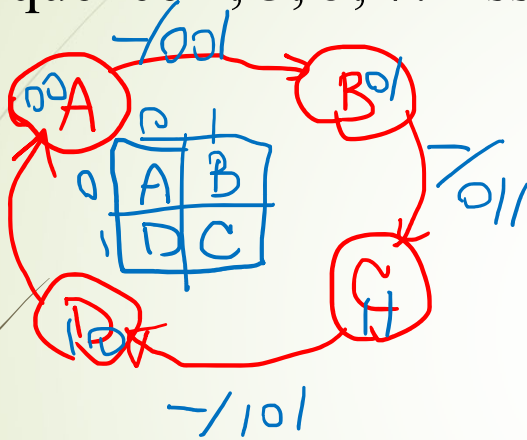
$$D_B = \bar{Q}_B \quad D_C = 1$$



Problem 2

Using D flip-flops, design a counter with the following repeated binary sequence 1, 3, 5, 7. Assign the sequence as output values.

Mealy



Q_A	Q_B	D_A	D_B	Z_2	Z_1	Z_0
0	0	0	1	0	0	1
0	1	1	1	0	1	1
1	0	0	0	1	1	1
1	1	1	0	1	0	1

$$D_A = Q_B$$

$$D_B = \overline{Q_A}$$

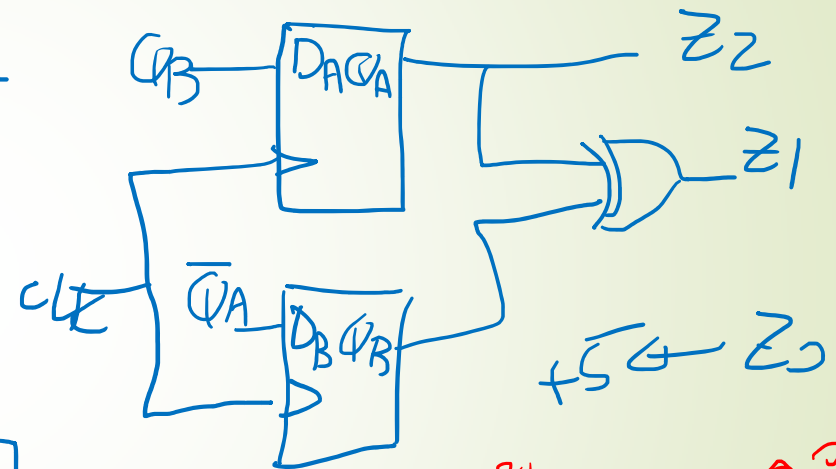
$$Z_2 = Q_A$$

$$Z_0 = 1$$

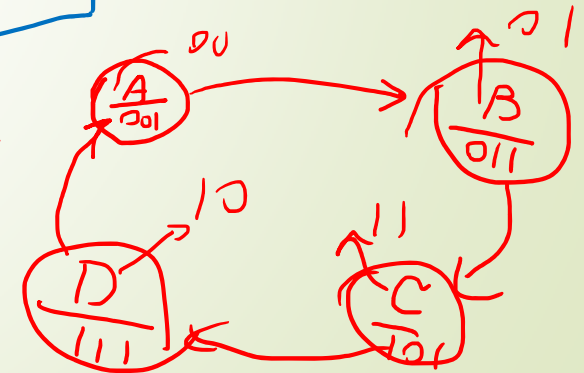
0	1
1	0

$$Z_1 = \overline{Q_A}Q_B + Q_A\overline{Q_B}$$

$$= Q_A \oplus Q_B$$

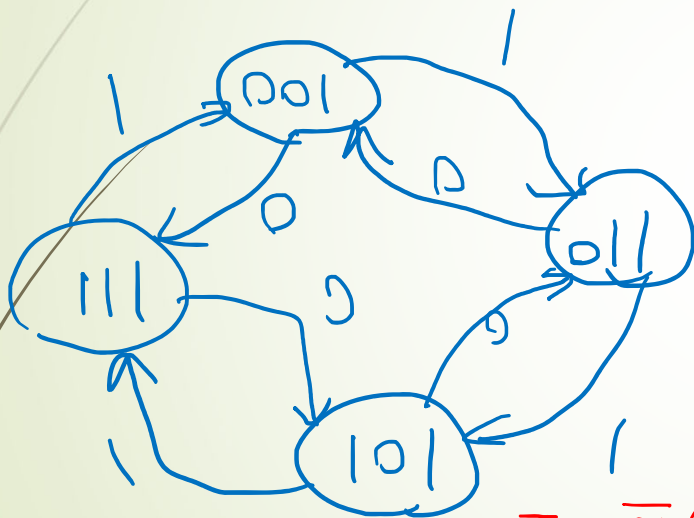


Moore



Problem 3

Using D flip-flops, design a counter with the following repeated binary sequence 1, 3, 5, 7 when input $X = 1$ and the reverse sequence when $X = 0$. Assign the sequence as state values.



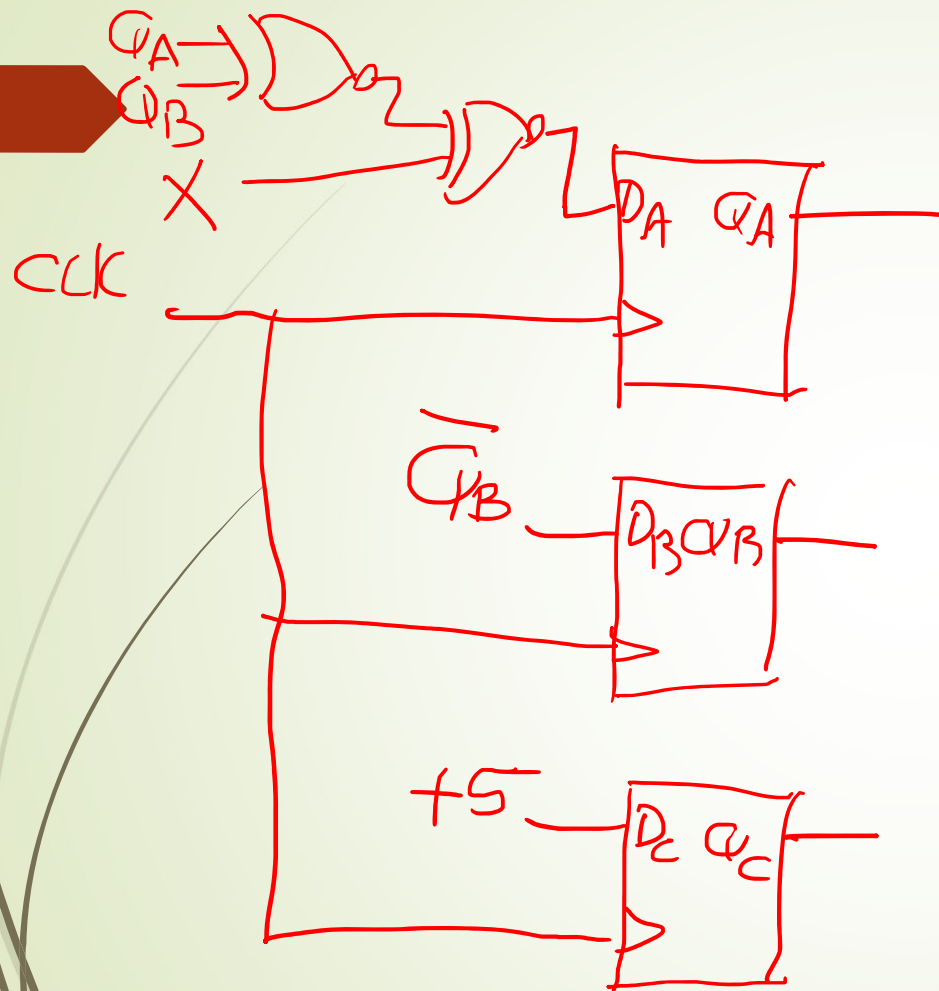
$$D_A = \overline{Q_A} \overline{Q_B} \overline{X} + Q_A Q_B \overline{X} + \overline{Q_A} Q_B X + Q_A \overline{Q_B} X$$

$$\overline{X}(Q_A \oplus Q_B) + X(Q_A \oplus Q_B) = (Q_A \oplus Q_B)$$

$Q_A Q_B Q_C X$	D_A Q_A	D_B Q_B	D_C Q_C
000	X	X	X
001	X	X	X
010	X	X	X
011	X	X	X
100	X	X	X
101	X	X	X
110	X	X	X
111	X	X	X

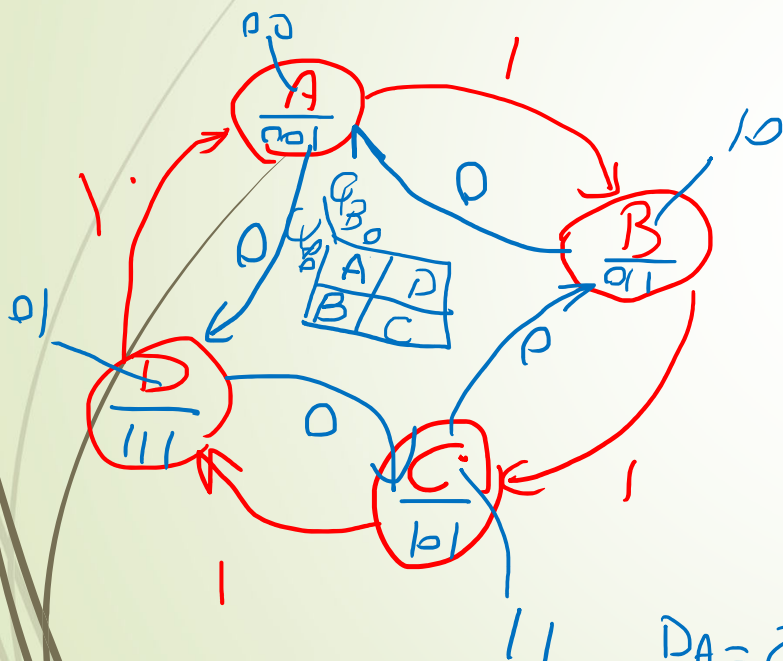
Q_A	Q_B	Q_C	X
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

Q_A	Q_B	Q_C	X
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1



Problem 3

Using D flip-flops, design a counter with the following repeated binary sequence 1, 3, 5, 7 when input $X = 1$ and the reverse sequence when $X = 0$. Assign the sequence as state values.



Q_A	Q_B	X	Q_A	Q_B	Z_2	Z_1	Z_0
0	0	0	0	1	0	0	1
0	0	1	1	0	0	0	1
0	1	0	1	1	1	1	1
0	1	1	0	0	1	1	1
1	0	0	0	0	0	1	1
1	0	1	1	1	0	1	1
1	1	0	1	0	1	0	1
1	1	1	0	1	1	0	1

Q_A	Q_B	X	D_A	D_B	Z_2	Z_1	Z_0
0	0	0	0	1	0	0	1
0	0	1	1	0	0	0	1
0	1	0	1	1	1	1	1
0	1	1	0	0	1	1	1
1	0	0	0	0	0	1	1
1	0	1	1	1	0	1	1
1	1	0	1	0	1	0	1
1	1	1	0	1	1	0	1

$$D_A = \overline{Q_B}X + Q_B\overline{X} = Q_B \oplus X$$

$$D_B = \overline{Q_A}\overline{X} + Q_A X = \overline{Q_A} \oplus X$$

$$Z_1 = \overline{Q_A}Q_B + Q_A\overline{Q_B} = Q_A \oplus Q_B$$

