* Digital Electronics and Logic Design (DELD) - Practical Number - 12

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Title :-
Sequence Generator.

Aim :-
Design and implement sequence generator using D flip-flop.

Objectives :-
Design sequence generator for :-
① Odd Sequence
② Even Sequence

Theory :-
For the design of sequence generator particular sequence can be determined as follows.
No. of flip-flop required to generate particular sequence can be determined as follows :-
① Find the number of 1's in the sequence
② Find the number of 0's in the sequence

③ Take the maximum out of two.

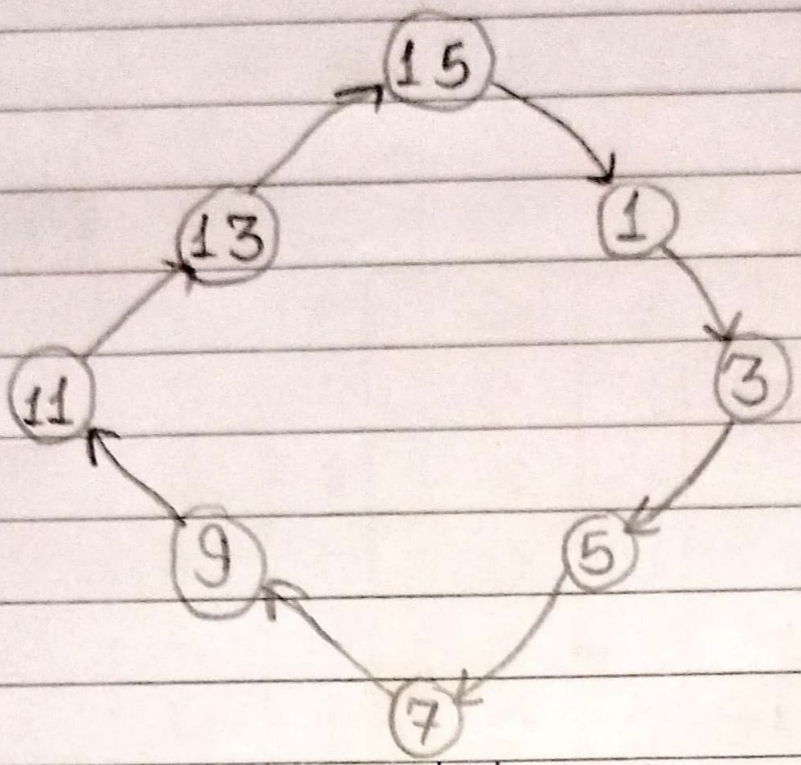
④ If N is the required no. of flip-flop, choose minimum value of 'n' to satisfy equation given below:

$$Max(0's, 1's) \leq 2^{n-1}$$

Truth Table :-

1) Sequence Generator for Odd Number (4-bit)

Present State				Next State			
Q_A	Q_B	Q_C	Q_D	Q_{A+1}	Q_{B+1}	Q_{C+1}	Q_{D+1}
0	0	0	0	X	X	X	X
0	0	0	1	0	0	1	1
0	0	1	0	X	X	X	0
0	0	1	1	0	1	0	1
0	1	0	0	X	X	X	X
0	1	0	1	0	1	1	1
0	1	1	0	X	X	X	X
0	1	1	1	1	0	0	1
1	0	0	0	X	X	X	X
1	0	0	1	1	0	1	1
1	0	1	0	X	X	X	X
1	0	1	1	1	1	0	1
1	1	0	0	X	X	X	X
1	1	0	1	1	1	1	1
1	1	1	0	X	X	X	X
1	1	1	1	0	0	0	1



Simplification using truth table and kmaps :-

$$D_A = Q_A \overline{Q}_C + Q_A \overline{Q}_B + \overline{Q}_A Q_B Q_C$$

$$D_B = Q_B \overline{Q}_C + \overline{Q}_B Q_C$$

$$D_C = \overline{Q}_C$$

$$D_D = 1.$$

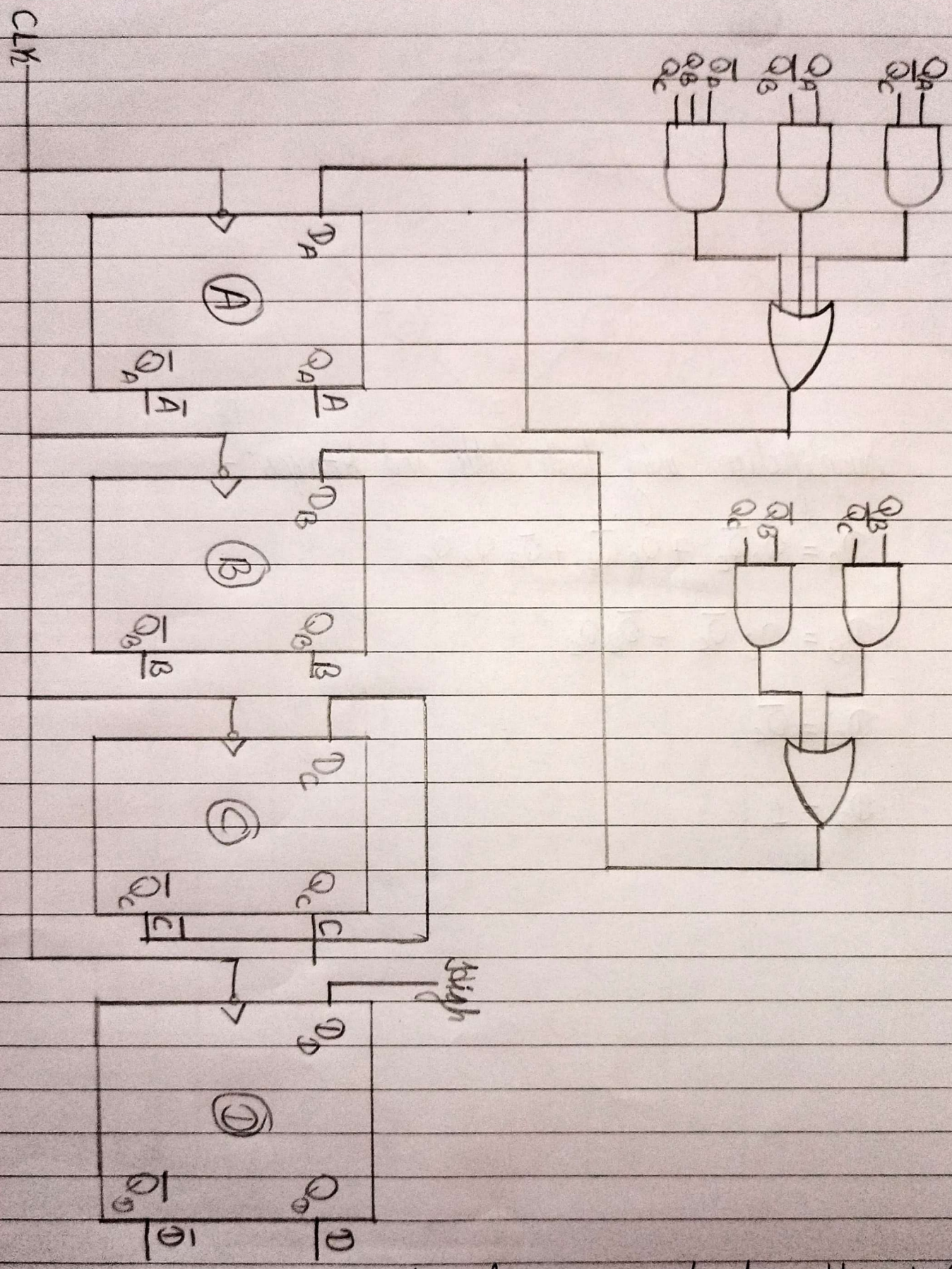
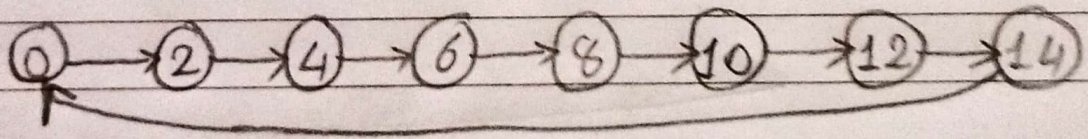


fig:- Sequence generator for odd number (4-bit).

2) Sequence Generator for even number (4-bit)-

Present State				Next State			
Q_A	Q_B	Q_C	Q_D	Q_{A+1}	Q_{B+1}	Q_{C+1}	Q_{D+1}
0	0	0	0	0	0	1	0
0	0	0	1	X	X	X	X
0	0	1	0	0	1	0	0
0	0	1	1	X	X	X	X
0	1	0	0	0	1	1	0
0	1	0	1	X	X	X	X
0	1	1	0	1	0	0	0
0	1	1	1	X	X	X	X
1	0	0	0	1	0	1	0
1	0	0	1	X	X	X	X
1	0	1	0	1	1	0	0
1	0	1	1	X	X	X	X
1	1	0	0	1	1	1	0
1	1	0	1	X	X	X	X
1	1	1	0	0	0	0	0
1	1	1	1	X	X	X	X



Using truth table and kmap for simplification.

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

$D_B = Q_B\bar{Q}_C + \bar{Q}_B Q_C$

$D_C = \bar{Q}_C$

$D_D = 0$

Conclusion:-

Hence, we have design and implimented the sequence generator using D flip flop.