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Submitted by Sec - B

S2021 001 0027
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ASSIGNMENT - 7

Latches and Flip-flops.

(I) **Latches** –

(A) **SR Latch:**

S	R	Q	Q'
0	0	Latched	
0	1	0	1
1	0	1	0
1	1	Illegal	
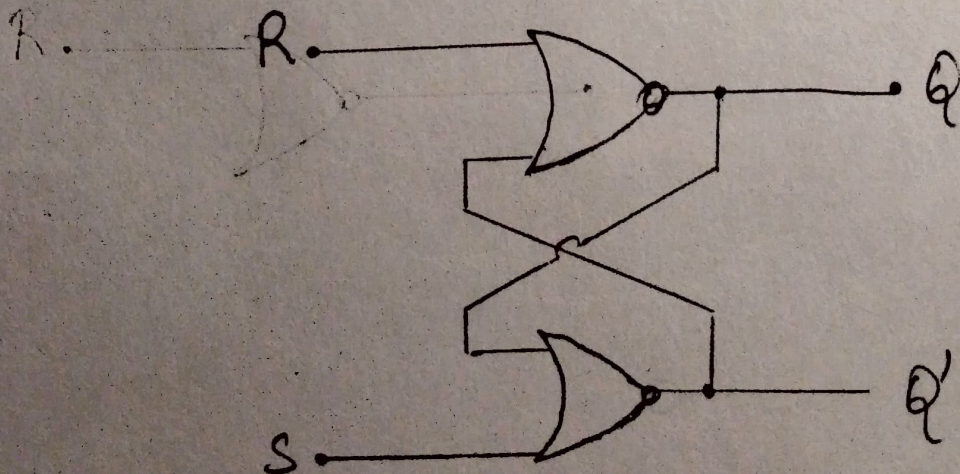
(B) Grated SR Latch:

E	S	R	Q Q'	
0	X	X	Latched	
1	0	0	Latched	
1	0	1	0	1
1	1	0	1	0
1	1	1	Illegal	

R **0**

S **1**

1

0

SR Latch

R **0**

En **1**

S **0**

0

1

Gated SR Latch
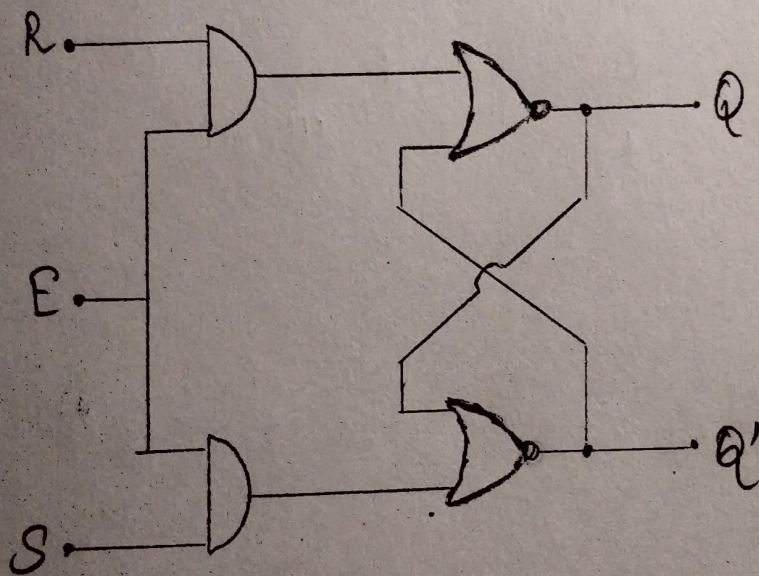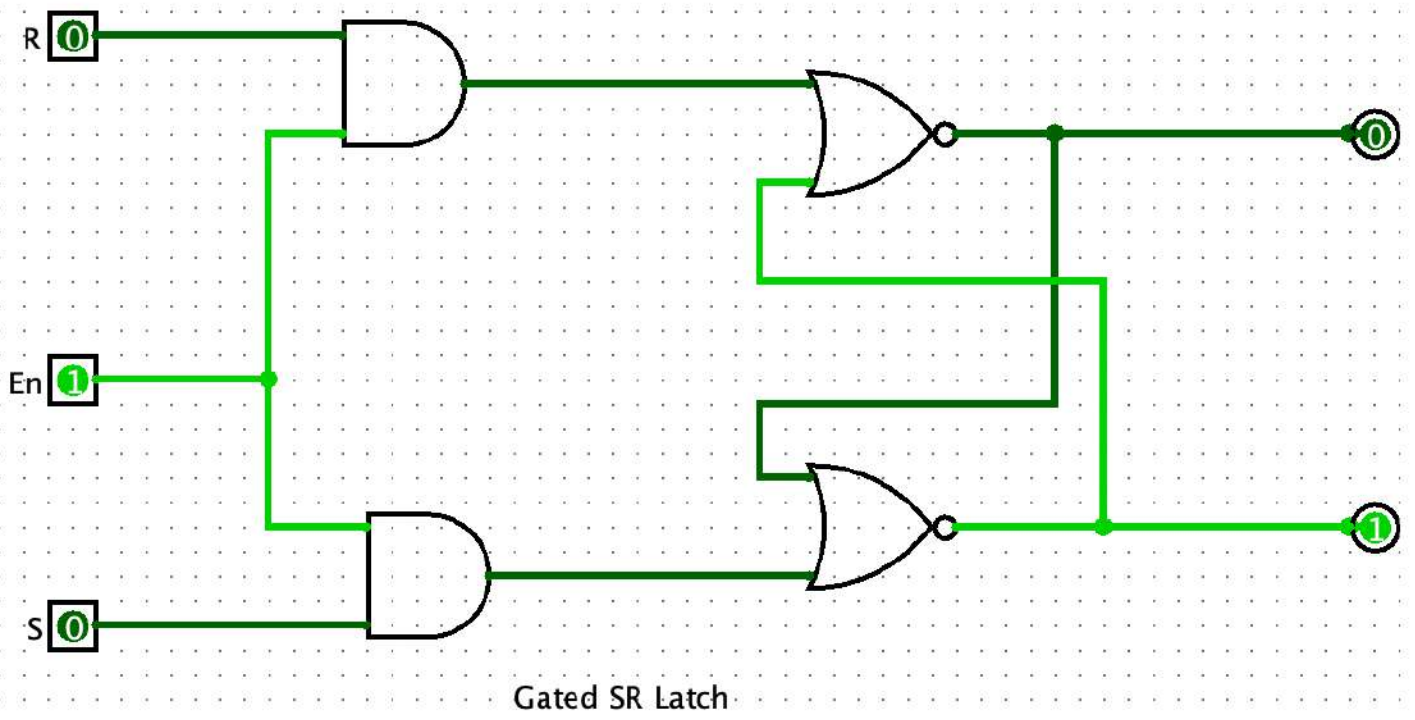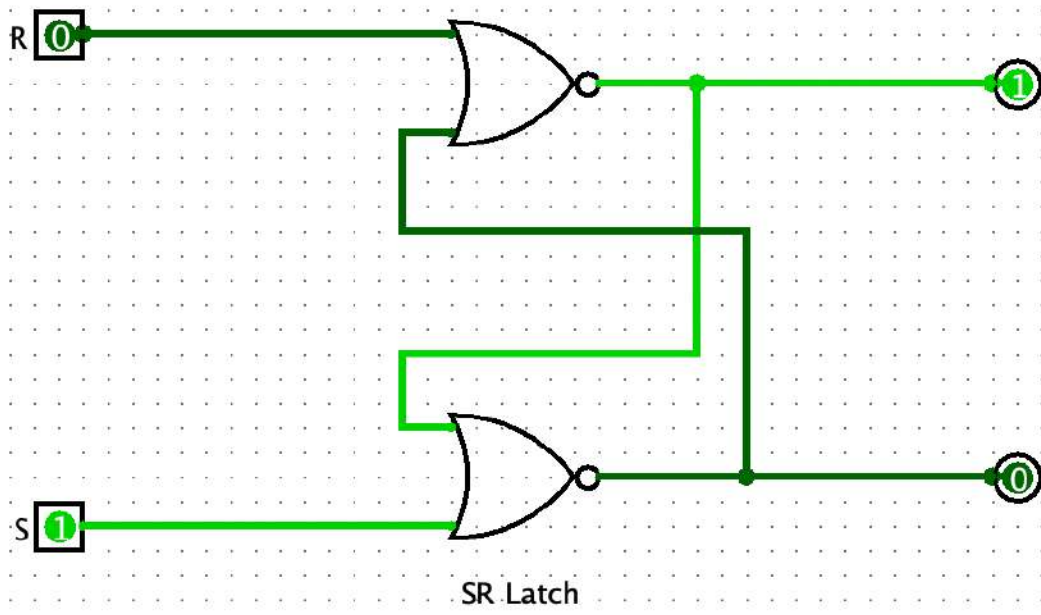
(o) <u>D latch :</u>

E	D	Q	Q'
0	x	Latched	
1	0	0	1
1	1	1	0

En **1**

D **0**

0

1

D Latch

4
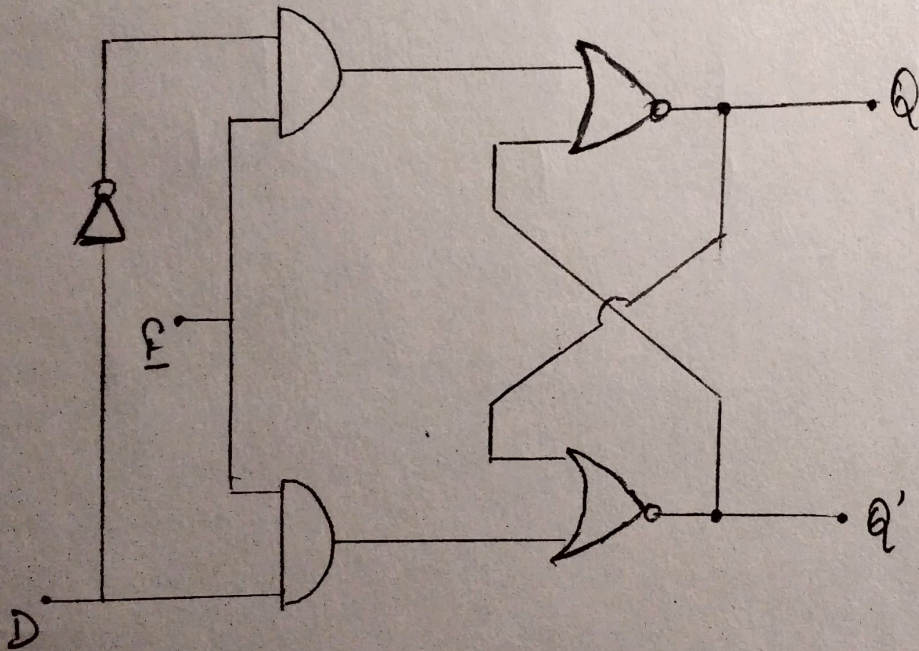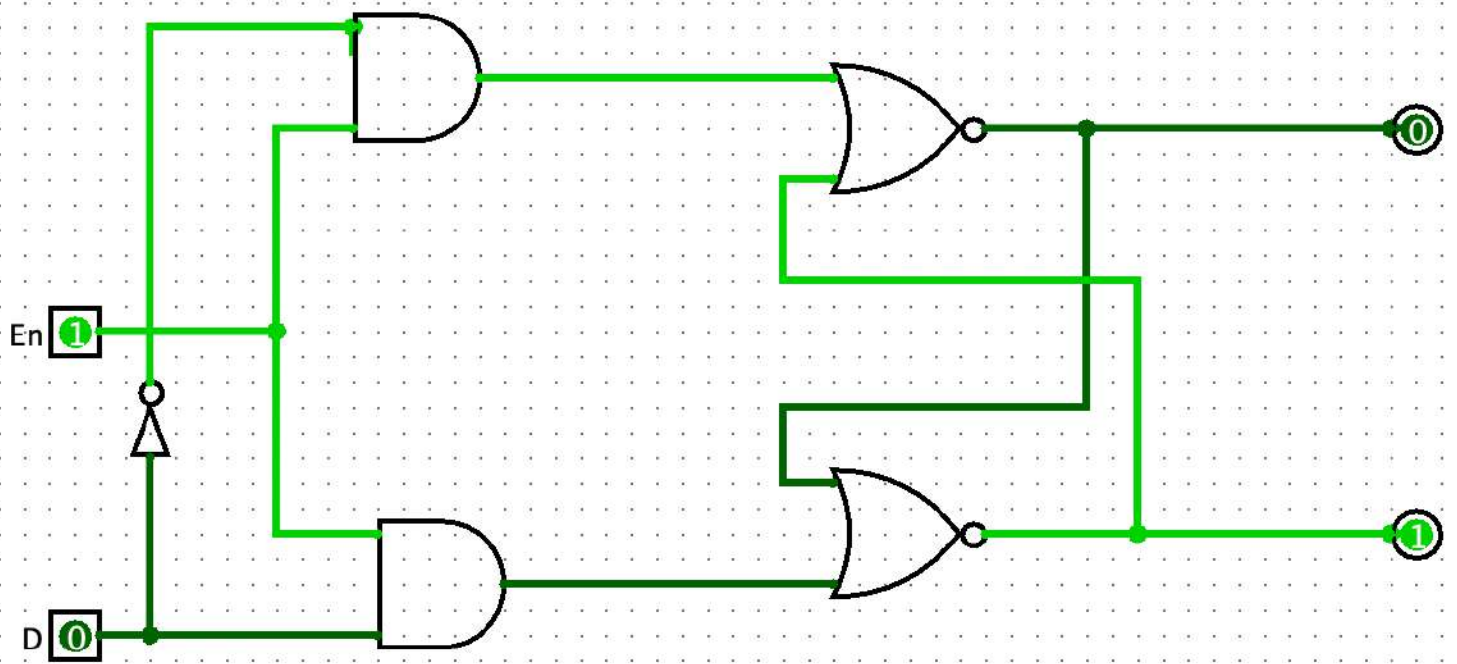
(II) Flip-flops –

(A) SR- flip-flop :

Clk	S	R	Q (t+1)
↑	0	0	Q(t)
↑	0	1	0
↑	1	0	1
↑	1	1	Illegal

R **0**

S **0**

1

0
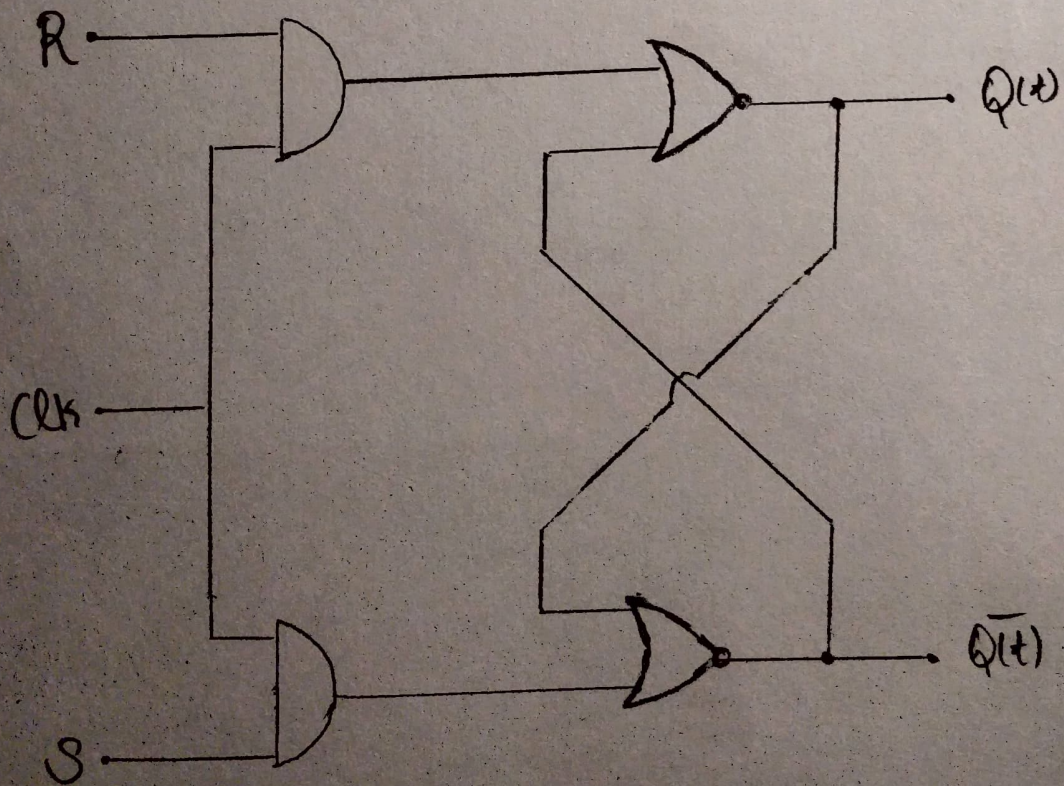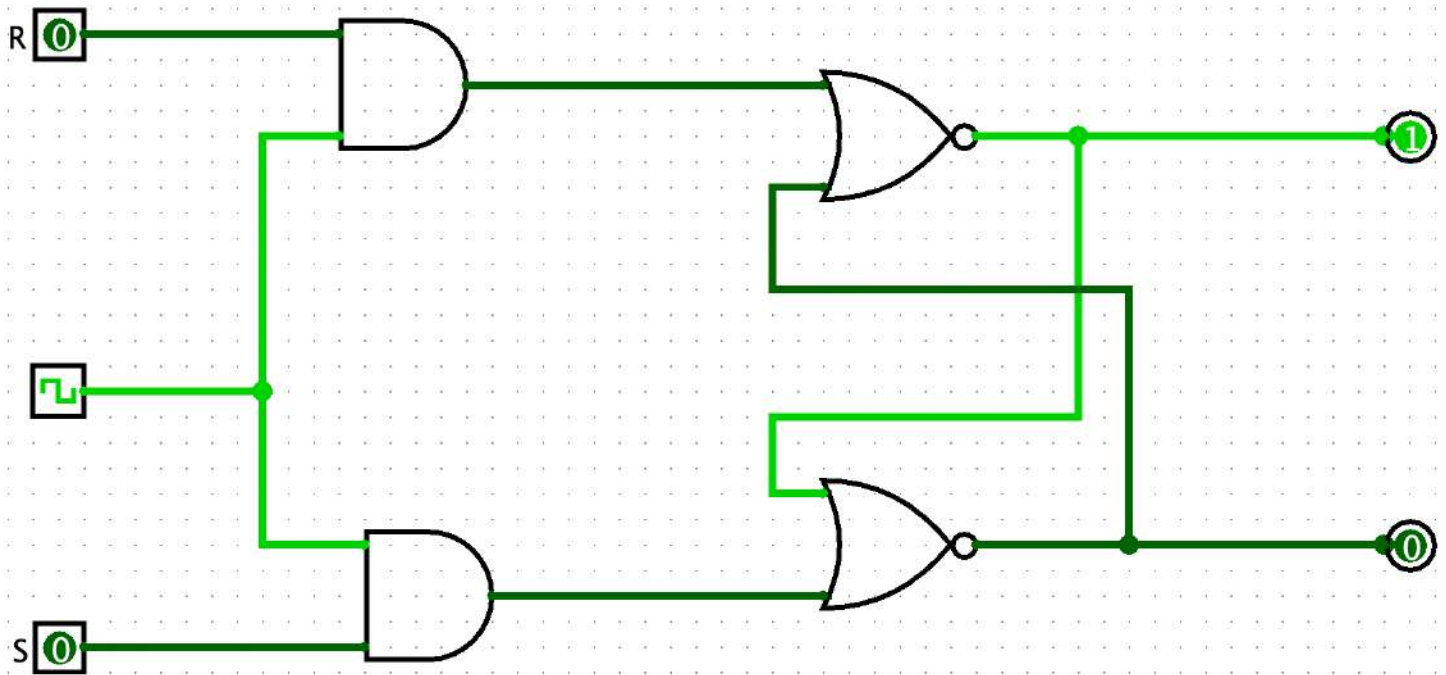
SR Flip Flop

(B) D-flip-flop:

Clk	D	Q(t+1)
↑	0	0
↑	1	1

Q(t)

Clk

Q̄(t)

D
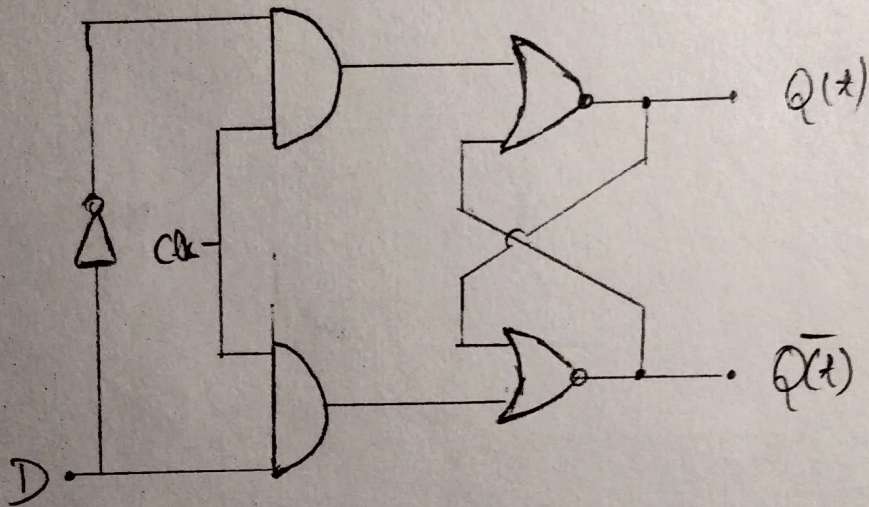
(C) JK flip flop:

Clk	J	K	Q(t+1)
↑	0	0	Q(t)
↑	0	1	0
↑	1	0	1
↑	1	1	Q̄(t)

D Flip Flop

K •

Clk •

J •

Q(t)

$\overline{Q(t)}$

K **1**

J **0**

0

1
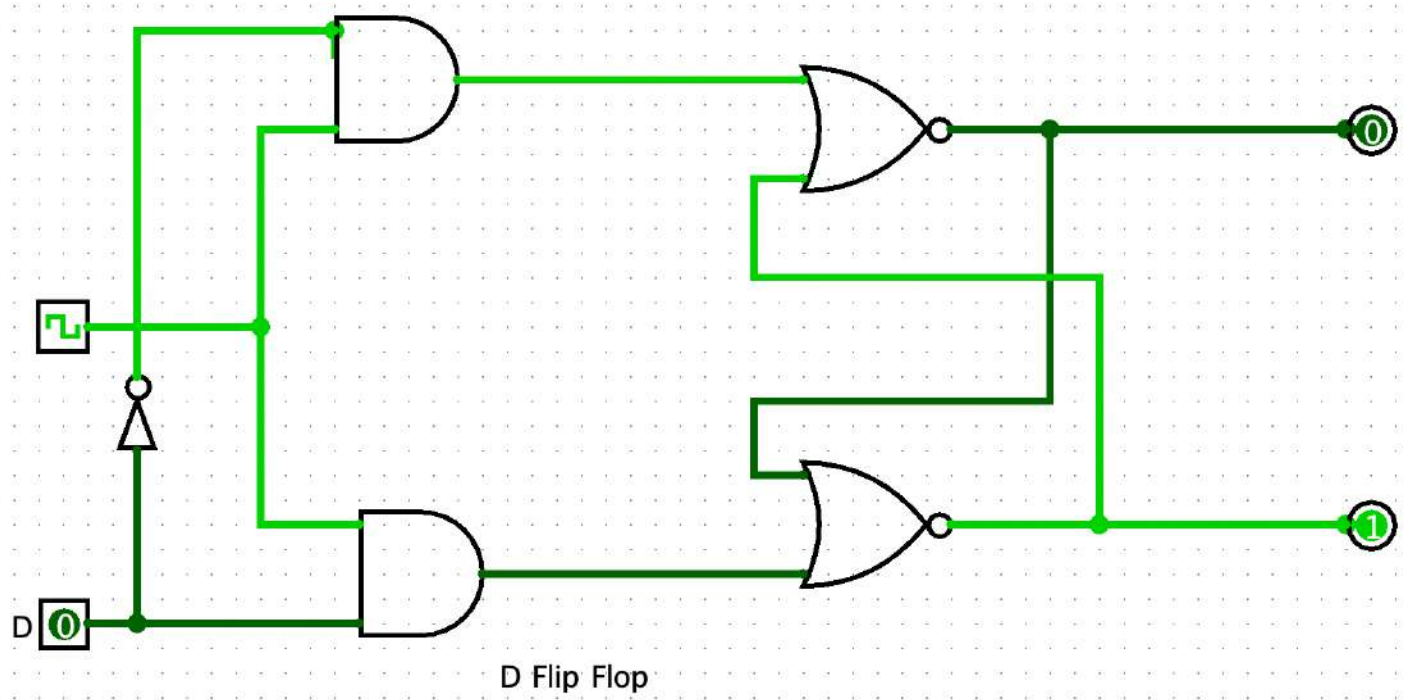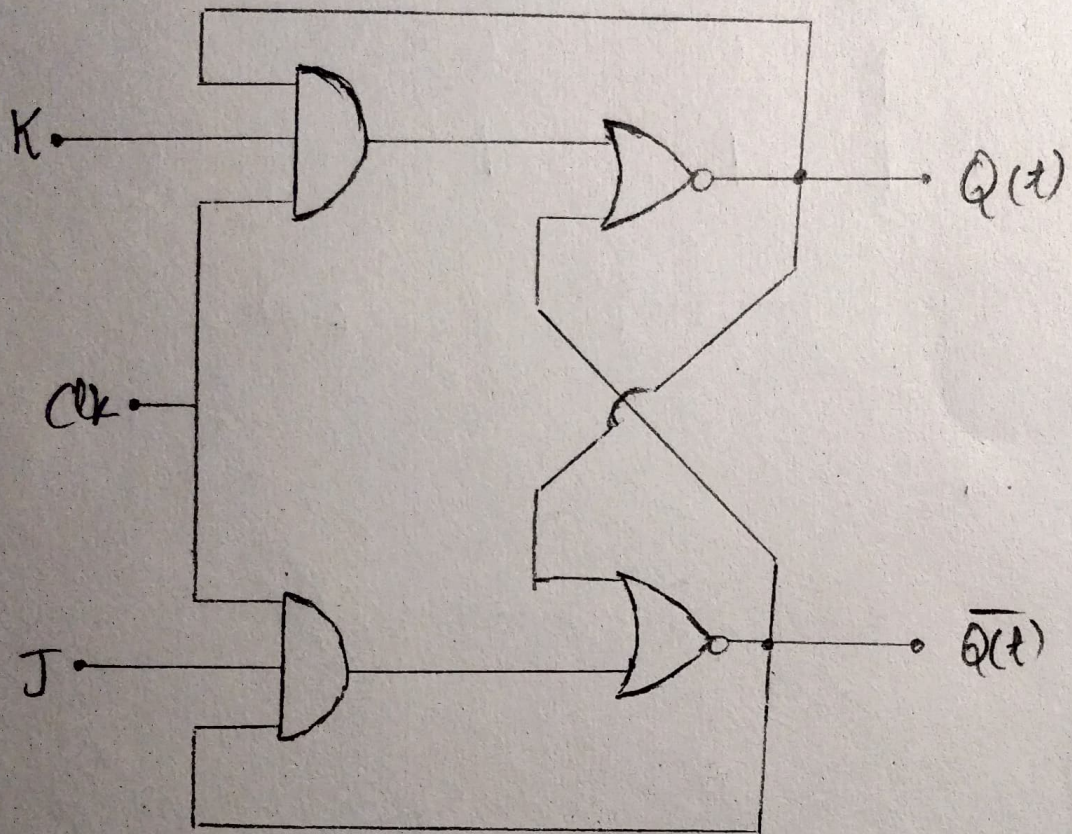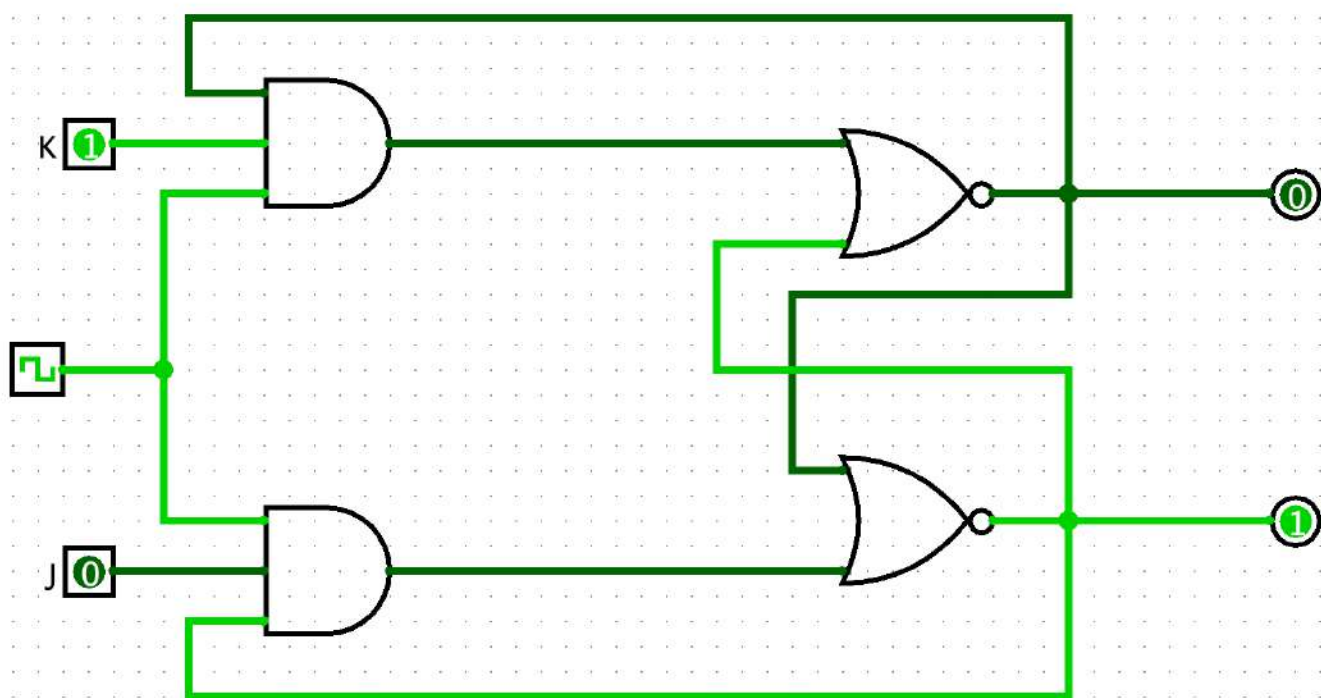
JK Flip Flop

(D) T flip-flop:

Clk	T	Q (t+1)
↑	0	Q(t)
↑	1	$\overline{Q(t)}$

Clk•

T•

Q(t)

$\overline{Q(t)}$

T Flip Flop