15-07-2022

# Lecture # 7

# NUMBER SYSTEM.

# Combinational logic circuits

#

# $(527)_8$ : $(AF8)_{16}$

$(101\ 010\ 111)_2$ : $(1010\ 1111\ 1000)_2$

$10^2\ 10^1\ 10^0$

$(273)_{10}$ : $(1010)_2$

$2^3\ 2^2\ 2^1\ 2^0$

B ← (1010)

6

1100

G ← (1100) → 10

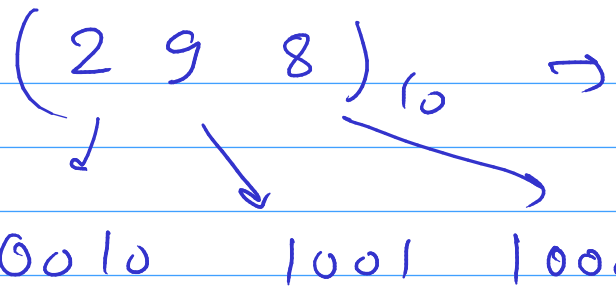
— G

BCD's →

$(127)_{10}$

0001 0010 0111

1 2 3



$(2\ 9\ 8)_{10} \rightarrow$

0010 1001 1000

$$
\begin{array}{rrcccc}
- & 2\overset{1}{3}7 & \rightarrow = & 0010 & 0011 & 0111 \\
- & 528 & = & 0101 & 0010 & 1000 \\
\hline
 & \underbrace{765} & & & & 1111
\end{array}
$$

BCD Binary

0 → 0000
1 → 0001
2 → 0010
3 → 0011
4 → 0100
5 → 0101
6 → 0110
7 → 0111
8 → 1000
9 → 1001

1001
+ 1
1010

10 → 0001 0000 → 1010

---

1 + 1001 → 9

× [1010, 1011, 1100, 1101, 1110, 1111] → 11, 12, 13, 14, 15

1111

0001 0000

10000
10001

0001 0001

→ Binary 1101 13

0001 0011

1001 → BCD → 9

BCD → 10

0001 0000

1001

+1

1010

9

+1

10

0001 0000

1 1

1010

116 6

10000

$$\begin{array}{r} 237 \\ -\ 528 \\ \hline 765 \end{array} \rightarrow \begin{array}{rrr} 0010 & 0011 & 0111 \\ 0101 & 0010 & 1000 \\ \hline 0111 & 0110 & 1111 \end{array}$$

$\underbrace{0111}_{7}$ $\underbrace{0110}_{6}$ $\underbrace{1111}_{110}$

$\underbrace{0101}_{5}$

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$$\begin{array}{r} 768 \\ 768 \\ \hline 1536 \end{array} \qquad \begin{array}{rrr} 0111 & 0110 & 1000 \\ 0111 & 0110 & 1000 \\ \hline & & 0000 \end{array}$$

$\underbrace{0000}_{110}$

$0110$

0000

1111

1010

1010

6

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$q_3$ $q_2$ $q_1$ $q_0$ = BCD

$b_3$ $b_2$ $b_1$ $b_0$ = BCD

| $q_3$ $q_2$ $q_1$ $q_0$ | S = |
|---|---|
| 0 0 0 0 | 0 |
| ⋮ | ⋮ |
| 1 0 0 1 | 0 |
| 1 0 1 0 | 1 |
| 1 0 1 1 | 1 |
| 1 1 0 0 | 1 |
| 1 1 0 1 | 1 |
| 1 1 1 0 | 1 |
| 1 1 1 1 | 1 |

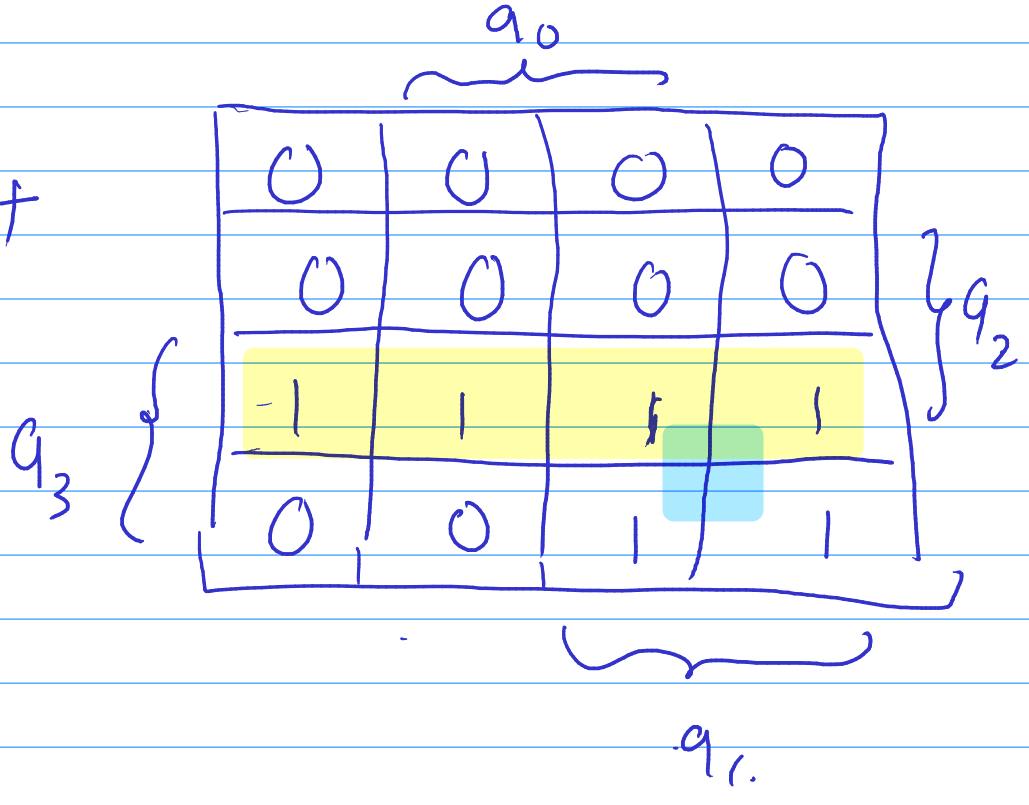
$S = f(q_0\ q_1\ q_2\ q_3)$

$S =$

| | $q_3$ | $q_2$ | $q_1$ | $q_0$ | S |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 |
| 2 | 0 | 0 | 1 | 0 | 0 |
| 3 | 0 | 0 | 1 | 1 | 0 |
| 4 | 0 | 1 | 0 | 0 | 0 |
| 5 | 0 | 1 | 0 | 1 | 0 |
| 6 | 0 | 1 | 1 | 0 | 0 |
| 7 | 0 | 1 | 1 | 1 | 0 |
| 8 | 1 | 0 | 0 | 0 | 0 |
| 9 | 1 | 0 | 0 | 1 | 0 |
| 10 | 1 | 0 | 1 | 0 | 1 |
| 11 | 1 | 0 | 1 | 1 | 1 |
| 12 | 1 | 1 | 0 | 0 | 1 |
| 13 | 1 | 1 | 0 | 1 | 1 |
| 14 | 1 | 1 | 1 | 0 | 1 |
| 15 | 1 | 1 | 1 | 1 | 1 |

$S = q_3 \cdot q_2 +$

$q_1 q_3$



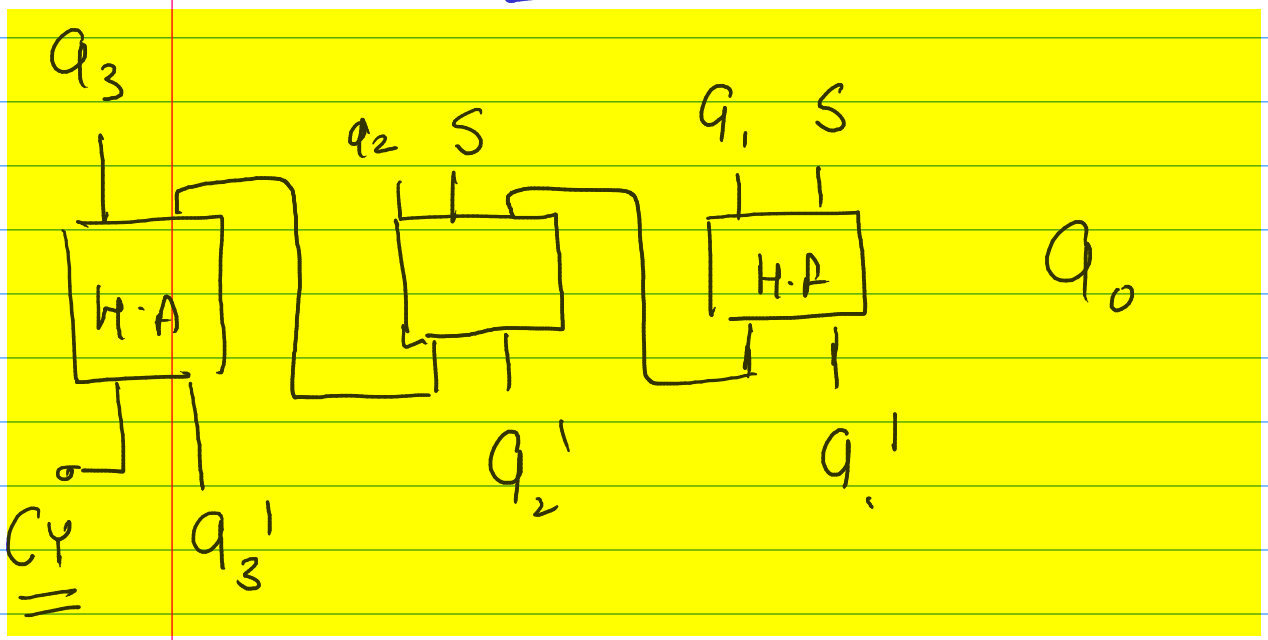
$q_3$ $q_2$ $q_1$ $q_0$ → S

\+ 0 0 0 0

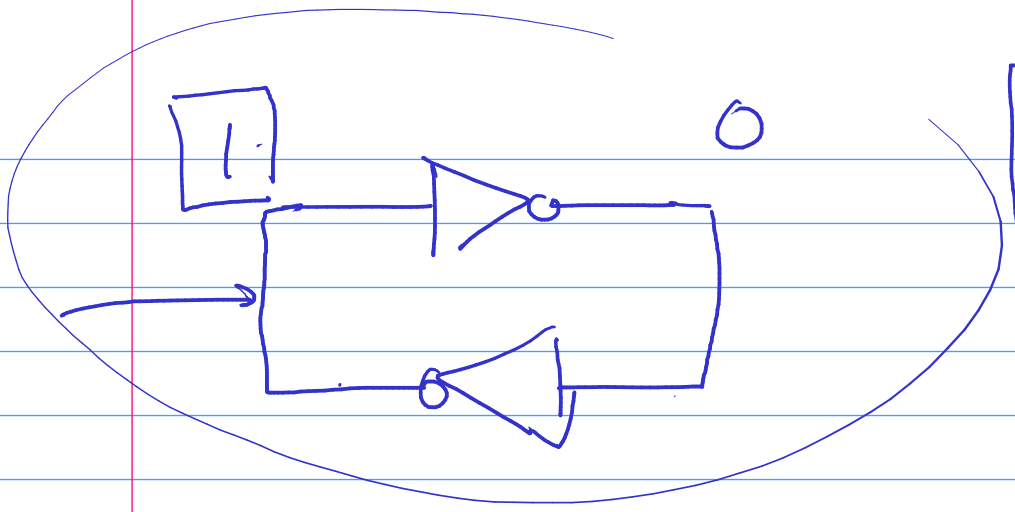
0 1 1 0

$q_3$ $q_2$ $q_1$ $q_0$

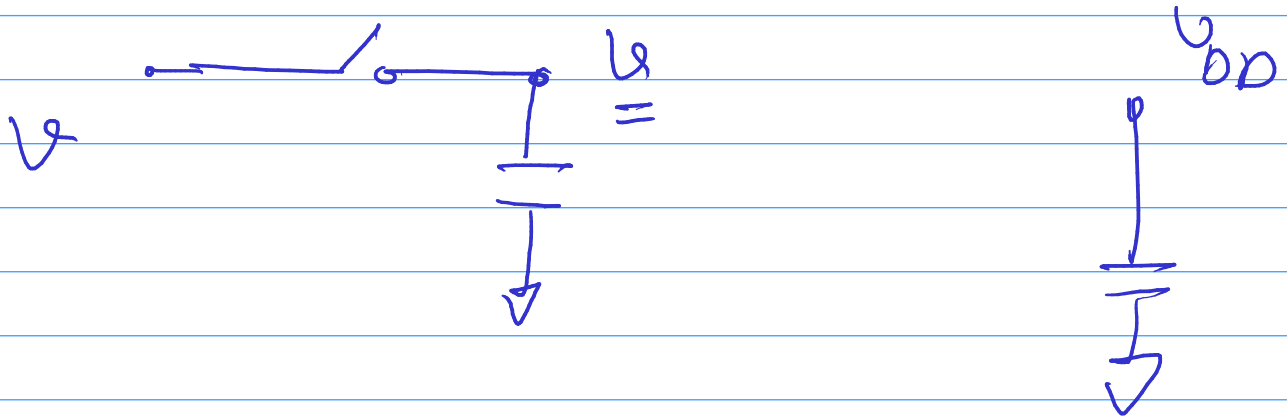
0 S S 0

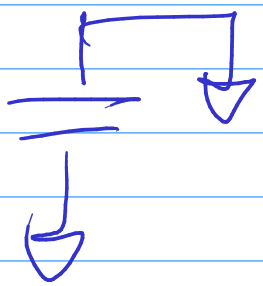



CY $q_3'$ $q_2'$ $q_1'$ $q_0$

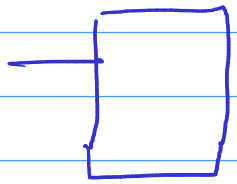


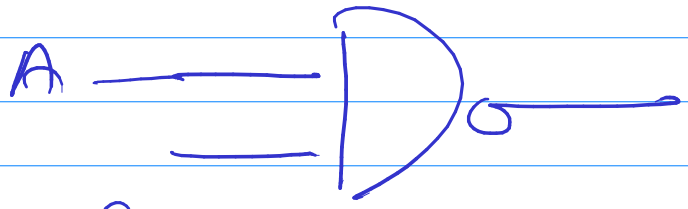

Static information



# LATCH | Flip-Flop



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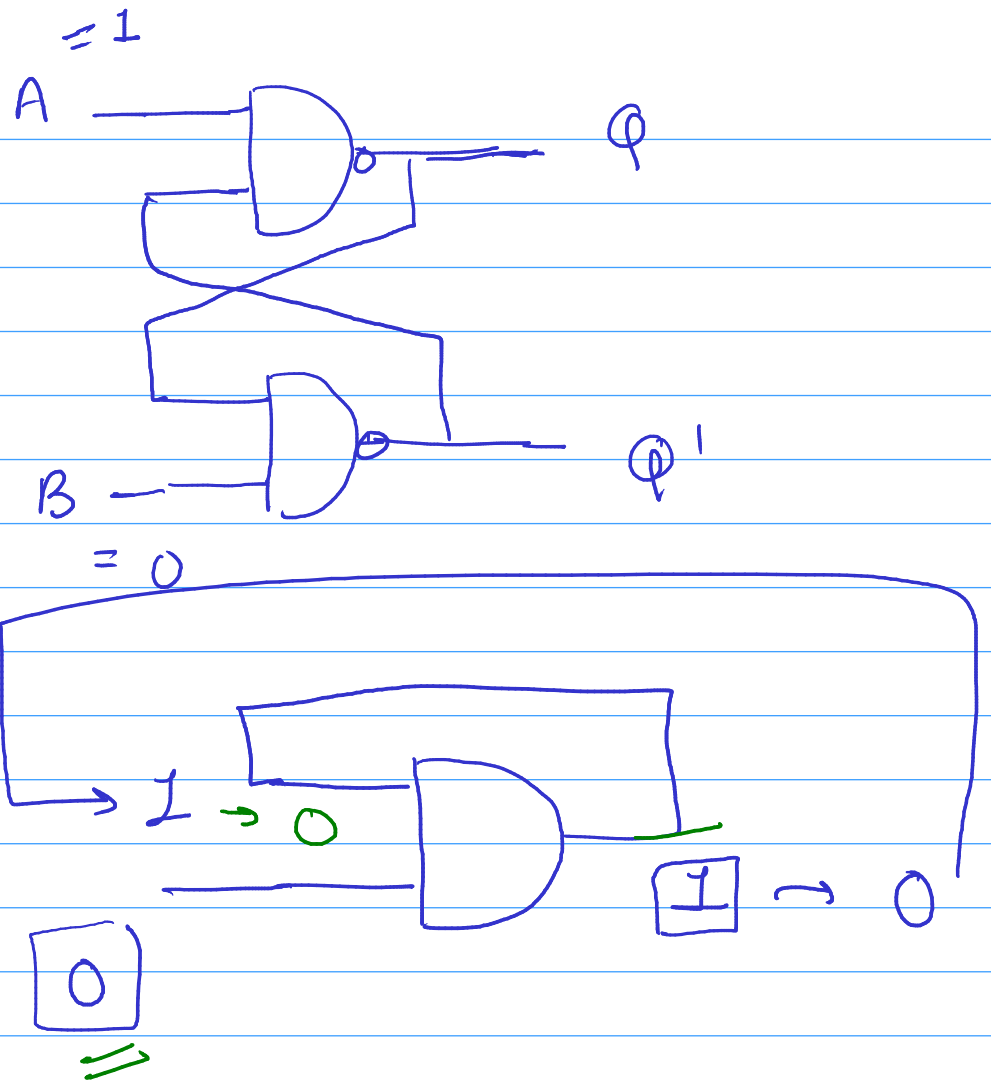
if the Block is En

I/p → O/p & will get Stored.

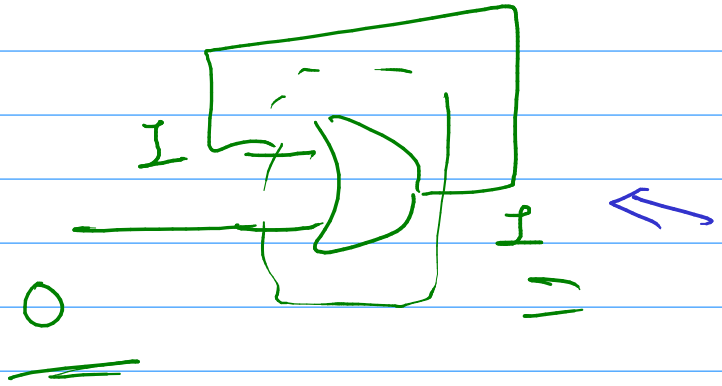
Otherwise En = 0

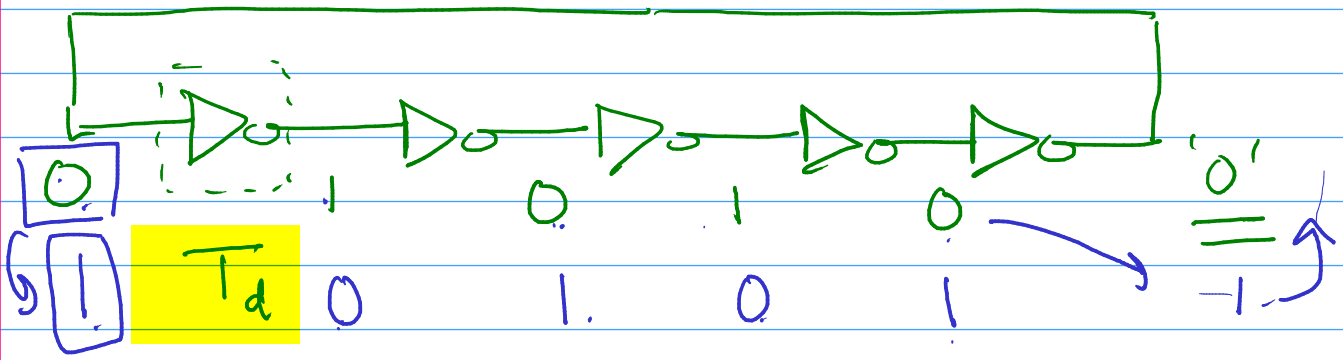
O/p → O/p (keep: Storing)

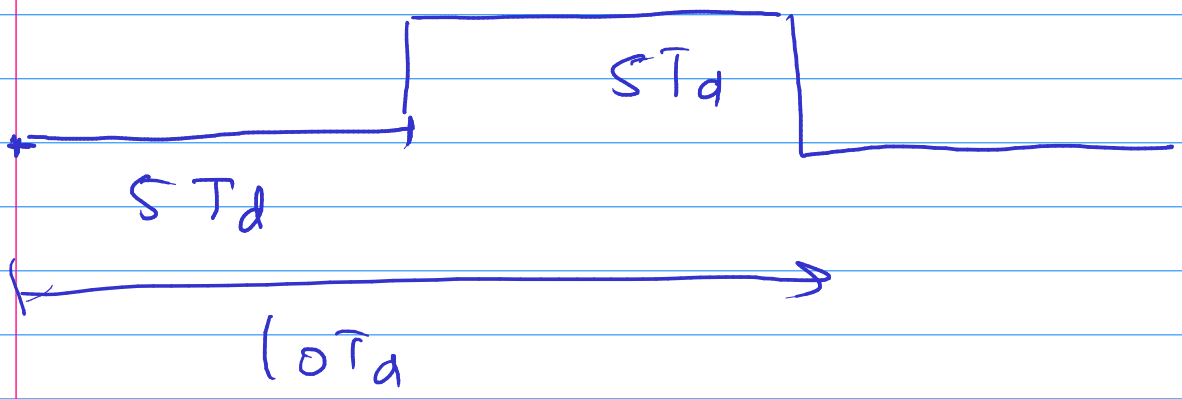
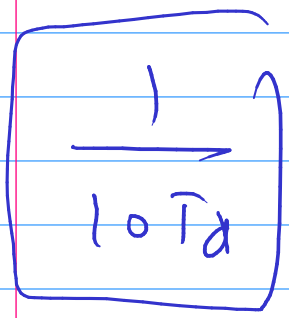



Stuck fault

Stuck at '0' fault






(1) → what will be your o/p