

(Lecture
5.6)

14/4/15

What are steps to design a logic circuit?

There are the following five different steps involved in designing of Logic Circuit.

- 1) Statement
- 2) Function Table / Truth Table
- 3) Expression
- 4) Simplification
- 5) Circuit Designing

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—: Expressions :—

→ Expressions are written in Boolean Algebra (Algebra based on 0's & 1's.)

How to write expressions?

We have two ways for expressions:-

- i) Sum of Min-Terms
- ii) Product of Max-Terms.

• Min-Terms:-

All input variables should be present & have dot operation (and operation).

• Max-Terms:-

All input variables should be present
& have or-operation.

Note:-

Max-Terms are the complement of Min-Terms.

Example:-

We have Truth Table with random values, we will find sum of min-Terms & product of Max-Terms.

A	B	F	min-Terms	Max-Terms
0	0	0	$A'B'$	$(A'B')' = A+B$
0	1	1	$A'B$	$(A'B)' = A+B'$
1	0	0	AB'	$(AB')' = A'+B$
1	1	1	AB	$(AB)' = A'+B'$

→ Sum of Min-Terms:-

Select those having function values "1"

$$F = A'B + AB$$

→ Product of Max-Terms:-

Select those having function value "0"

$$F = (A+B) \cdot (A'+B')$$

Simplification Methods

We have following three simplification methods:-

- i) K-maps
- ii) Tabulation Method
- iii) Algebraic Manipulation / Quotient Method

Practice Question for K-map:-

Simplify following table according to Product of Sum?

A \ BC	00	01	11	10
0	0	0	0	0
1	1	1	0	1

$$F' = A' + BC$$

To find product of sum, we will take compliment of above expression.

$$(F')' = (A' + BC)'$$

$$F = A \cdot (B' + C')$$

—: Digital Logic :—

Digital Logic have two families:—

- i) Combinational Logics. → Combinational Circuits
- ii) Sequential Logics → Sequential Circuits.

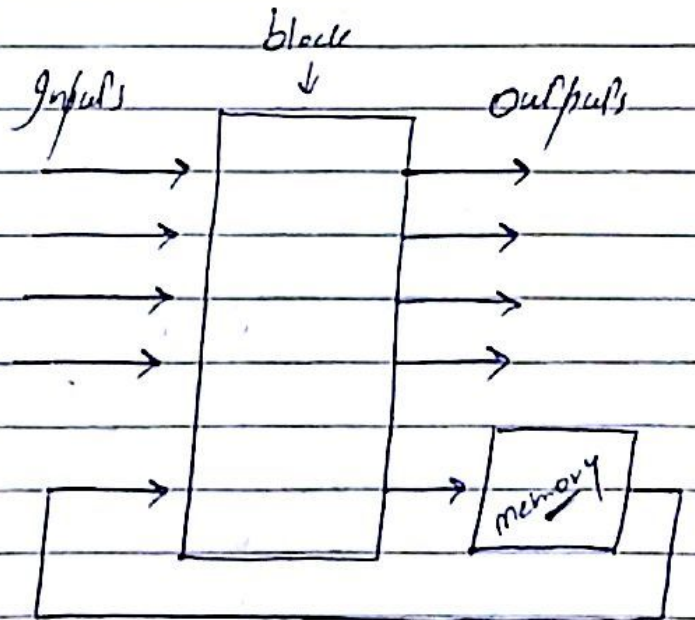
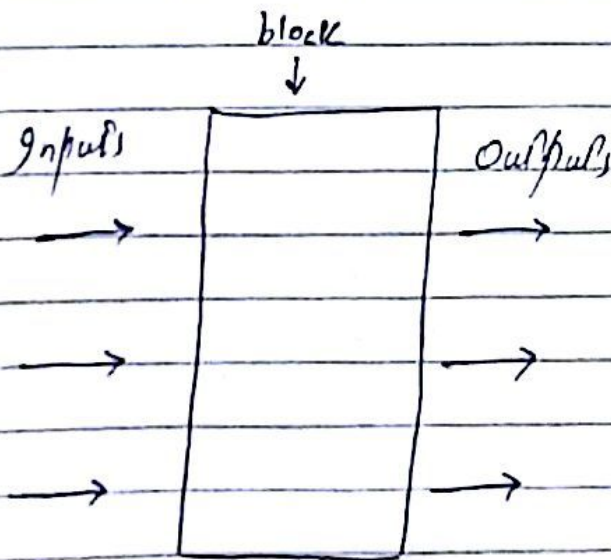
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—: Difference :—

Combinational Circuits

Sequential Circuits

• Only input & outputs are involved.

memory also involves along input & output.



Example:-

Half Adder, Full Adder,
Decoder, Encoder
Etc.

memory is used to find out next outputs by using previous output records.

$$\text{Current Output} = \text{Current Inputs} + \text{Previous Outputs}$$

Example of Sequential Circuits:-

Latch is primary Sequential Circuit.

Latch \rightarrow Flip Flop Circuits.

\rightarrow Combinational Circuits:-

Example:-

"Full Adder"

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$$\begin{array}{r} C_n = 1 \quad 1 \quad 1 \quad 0 \\ A = 1 \quad 1 \quad 1 \quad 0 \\ B = 1 \quad 1 \quad 0 \quad 1 \\ \hline 1 \quad 0 \quad 0 \quad 0 \quad 0 \\ \hline \end{array}$$

where,

C_{in} = Carry in

Diagram for Full Adder:-

