Difference between combinational and sequential circuit

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Combinational circuits are defined as the time independent circuits which do not depends upon previous inputs to generate any output are termed as combinational circuits. **Sequential circuits** are those which are dependent on clock cycles and depends on present as well as past inputs to generate any output.

Combinational Circuit –

1. In this output depends only upon present input.
2. Speed is fast.
3. It is designed easy.
4. There is no feedback between input and output.
5. This is time independent.
6. Elementary building blocks: Logic gates
7. Used for arithmetic as well as boolean operations.
8. Combinational circuits don't have capability to store any state.
9. As combinational circuits don't have clock, they don't require triggering.
10. These circuits do not have any memory element.
11. It is easy to use and handle.
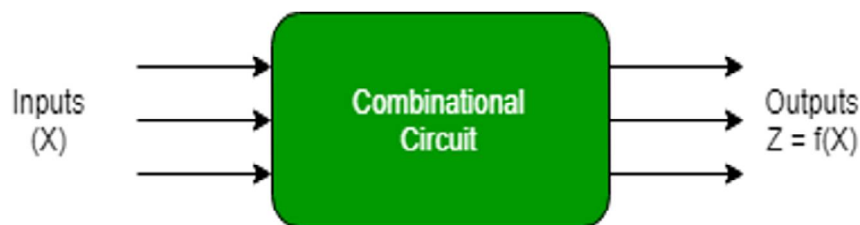   **Examples –** Encoder, Decoder, Multiplexer, Demultiplexer

Block Diagram –

Figure: Combinational Circuits

Sequential Circuit –

1. In this output depends upon present as well as past input.
2. Speed is slow.
3. It is designed tough as compared to combinational circuits.
4. There exists a feedback path between input and output.
5. This is time dependent.
6. Elementary building blocks: Flip-flops
7. Mainly used for storing data.
8. Sequential circuits have capability to store any state or to retain

earlier state.
9. As sequential circuits are clock dependent they need triggering.
10. These circuits have memory element.
11. It is not easy to use and handle.
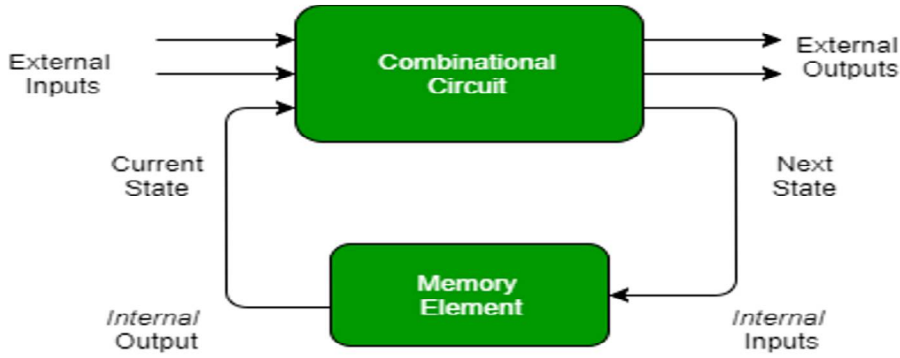**Examples** – Flip-flops, Counters

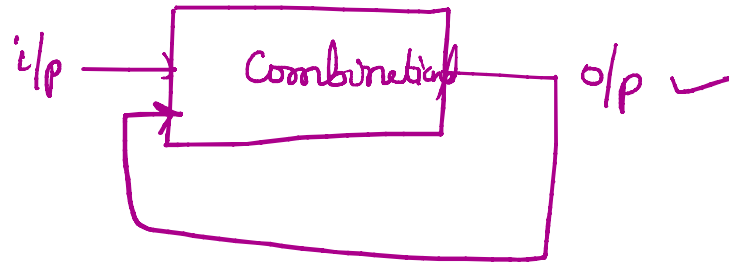**Block Diagram –**

Figure: Sequential Circuit

recent late

o/p
(past history of the i/p)

and p ___ $-s--$

Sequential ckt

i/p ⟶ Combinational ⟶ o/p ✓

Combinational ⟶ o/p depends on present i/p

Flip flop (memory) ⟶ 1 bit {$^0_1$

↓   ↳ low
High

seq {Registers} using flip flops
    {Counters}