

UNIT-II

SYNCHRONOUS SEQUENTIAL LOGIC

Introduction to sequential circuit- Flipflops -Operation and Excitation Tables. Triggering of FF. Analysis and design of clocked sequential circuits-Design- Moor/Mealy models, state minimization, state assignment, circuit implementation-Registers-Counters

1. INTRODUCTION TO SEQUENTIAL CIRCUIT:

In *combinational logic circuits*, the outputs at any instant of time depend only on the input signals present at that time. For any change in input, the output occurs immediately.

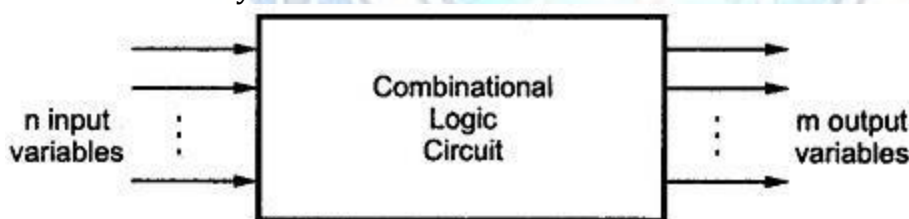
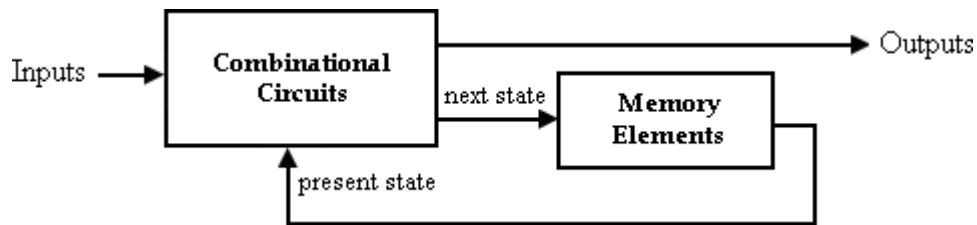


Fig. 3.7 Block diagram of a combinational circuit

In *sequential logic circuits*, it consists of combinational circuits to which storage elements are connected to form a feedback path. The storage elements are devices capable of storing binary information either 1 or 0. The information stored in the memory elements at any given time defines the present state of the sequential circuit. The present state and the external circuit determine the output and the next state of sequential circuits.

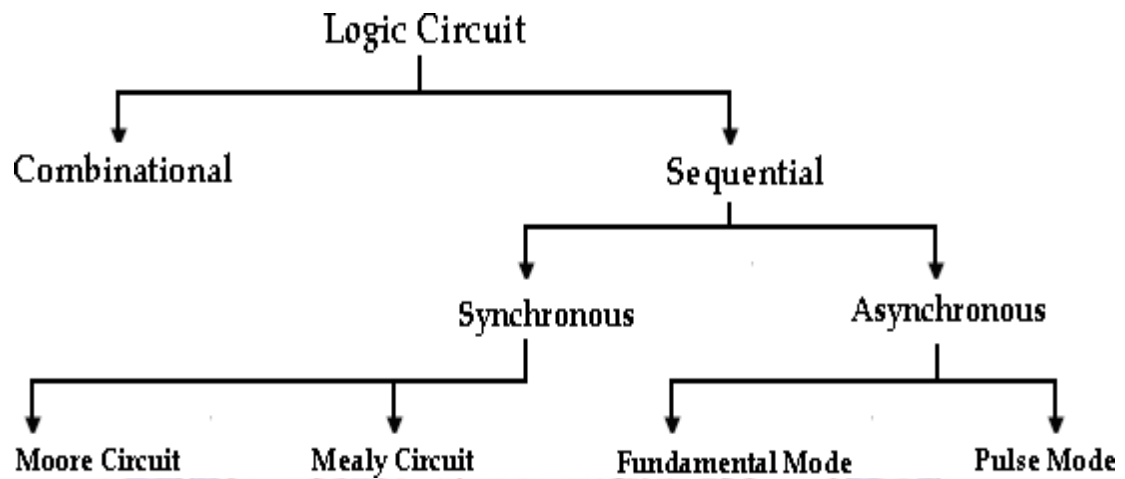


Sequential Circuit- Block Diagram

Thus in sequential circuits, the output variables depend not only on the The rotary channel selected knob on an old-fashioned TV is like a combinational. Its output selects a channel based only on its current input – the position of the knob. The channel- up and channel-down push buttons on a TV is like a sequential circuit. The channel selection depends on the past sequence of up/downpushes.

The comparison between combinational and sequential circuits is given intable below.

S.No	Combinational logic	Sequential logic
1	The output variable, at all times depends on the combination of input variables.	The output variable depends not only on the present input but also depend upon the past history of inputs.
2	Memory unit is not required.	Memory unit is required to store the past history of input variables.
3	Faster in speed.	Slower than combinational circuits.
4	Easy to design.	Comparatively harder to design.
5	Eg. Adder, subtractor, Decoder, Encoders, Magnitude comparator	Eg. Shift registers, Counters



S.No	Synchronous sequential circuits	Asynchronous sequential circuits
1	Memory elements are clocked Flip-Flops.	Memory elements are either unclocked flip-flops (Latches) or time delay elements.
2	The change in input signals can affect memory element upon activation of clock signal.	The change in input signals can affect memory element at any instant of time.
3	The maximum operating speed of clock depends on time delays involved.	Because of the absence of clock, it can operate faster than synchronous circuits.
4	Easier to design	More difficult to design